AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

SEPTEMBER 15, 1956

In This Issue

Heavy Duty Front and Rear Suspension Systems
VW Transporters Made in Europe's Newest Plant
Unique Setups for Making Powr-Lok Differentials
Assembly Lines for High Output of Fuel Tanks
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A CHILTON PUBLICATION

Heald VERSATILITY in action

How a STANDARD* Plain Internal Grinder SAVED IDLE MACHINE TIME

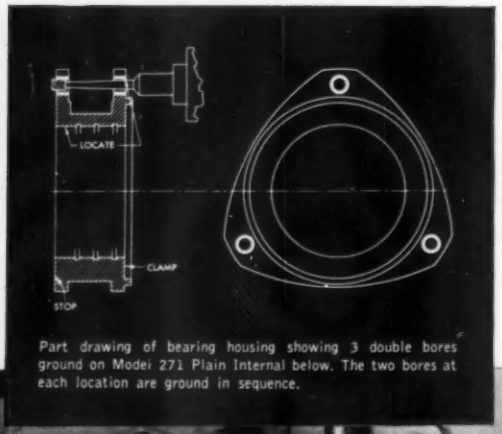
Heald Model 271 does a month's production ALL IN A DAY'S WORK . . . and can do many other jobs in its "spare time"

THE race is not always to the swift. For example: An aircraft manufacturer requested a quotation on a Model 271 Size-Matic for grinding three double bores in a bearing housing. Production requirements — 25 parts per month. A high-speed Size-Matic would do the whole job in less than a day — and be idle the rest of the time. So Heald engineers recommended a Model 271 Plain Internal instead. This *semi-automatic* machine could still do the whole month's production in one day — yet because of its inherent *versatility*, the standard Plain machine could be used for many other internal grinding jobs in its "spare time".

This solution to the problem not only saved on the initial investment, but avoided idle machine time and contributed to greater productivity and lower costs. The 271 Plain Internal, and the job for which it was ordered, are shown below. For the *best answer* to any precision finishing problem . . .

It PAYS to come to Heald

**Send for Bulletin 2-2569-1, Issue 1.*



Part drawing of bearing housing showing 3 double bores ground on Model 271 Plain Internal below. The two bores at each location are ground in sequence.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

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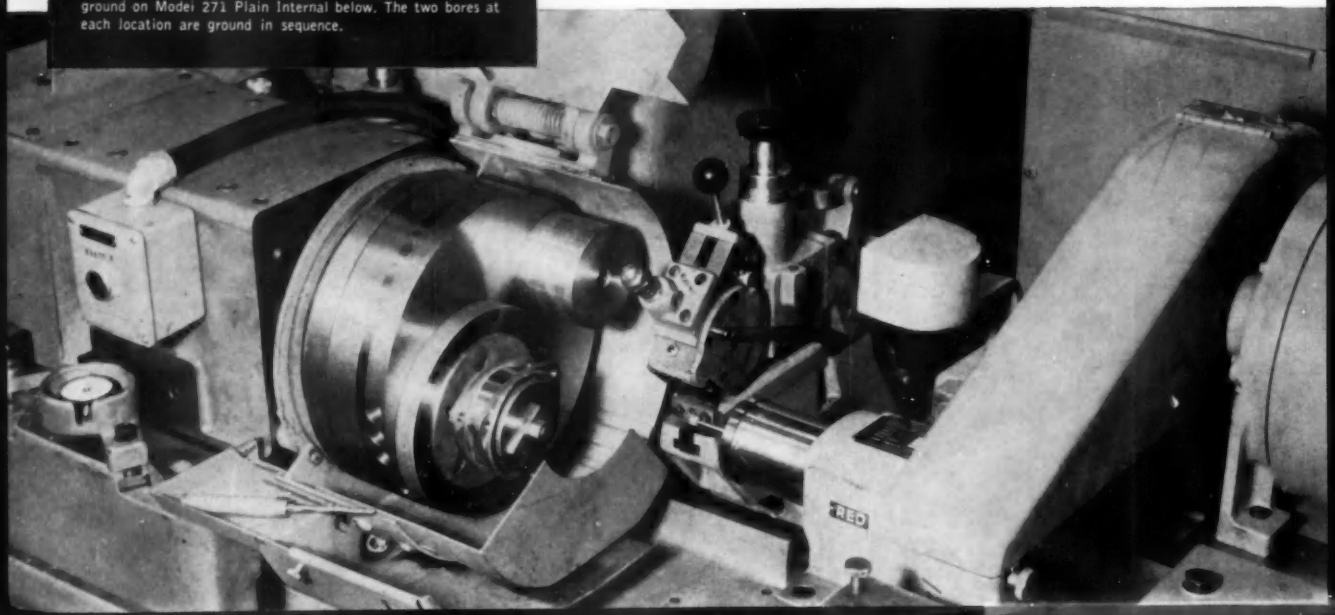
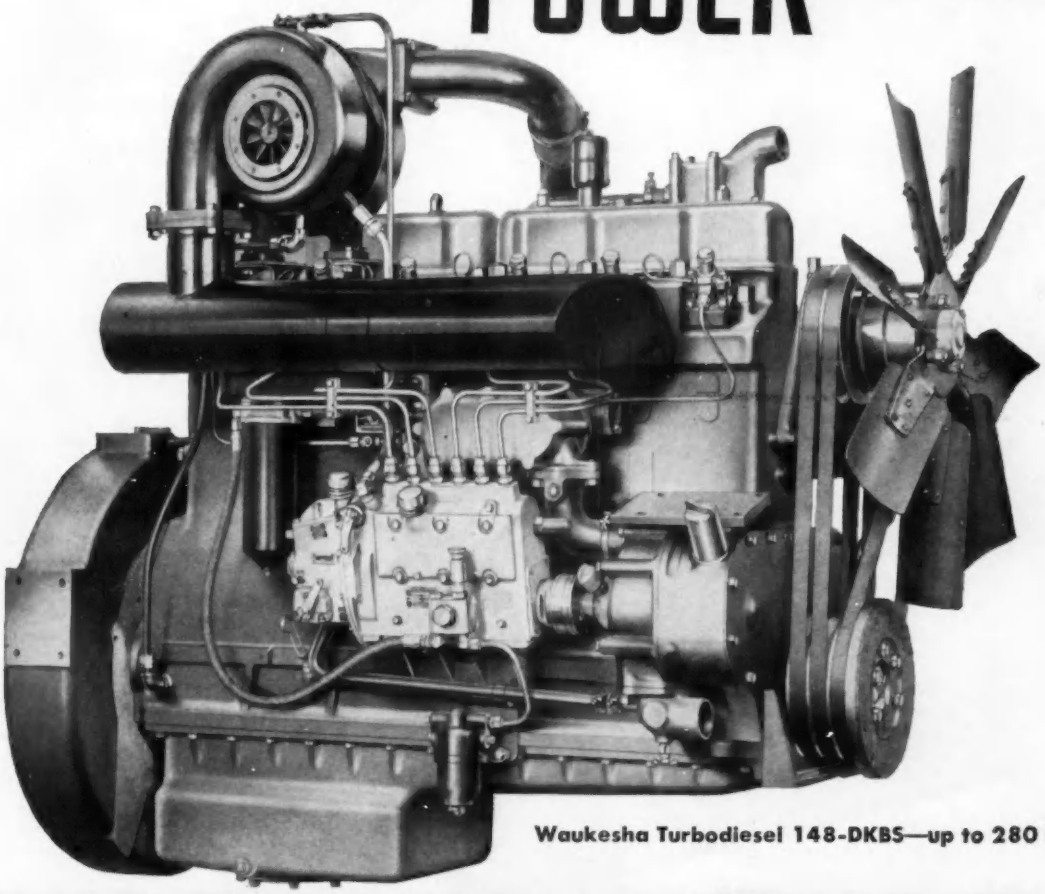


MORE POWER TO YOU!



Waukesha Turbodiesel 148-DKBS—up to 280 hp

WAUKESHA Diesels

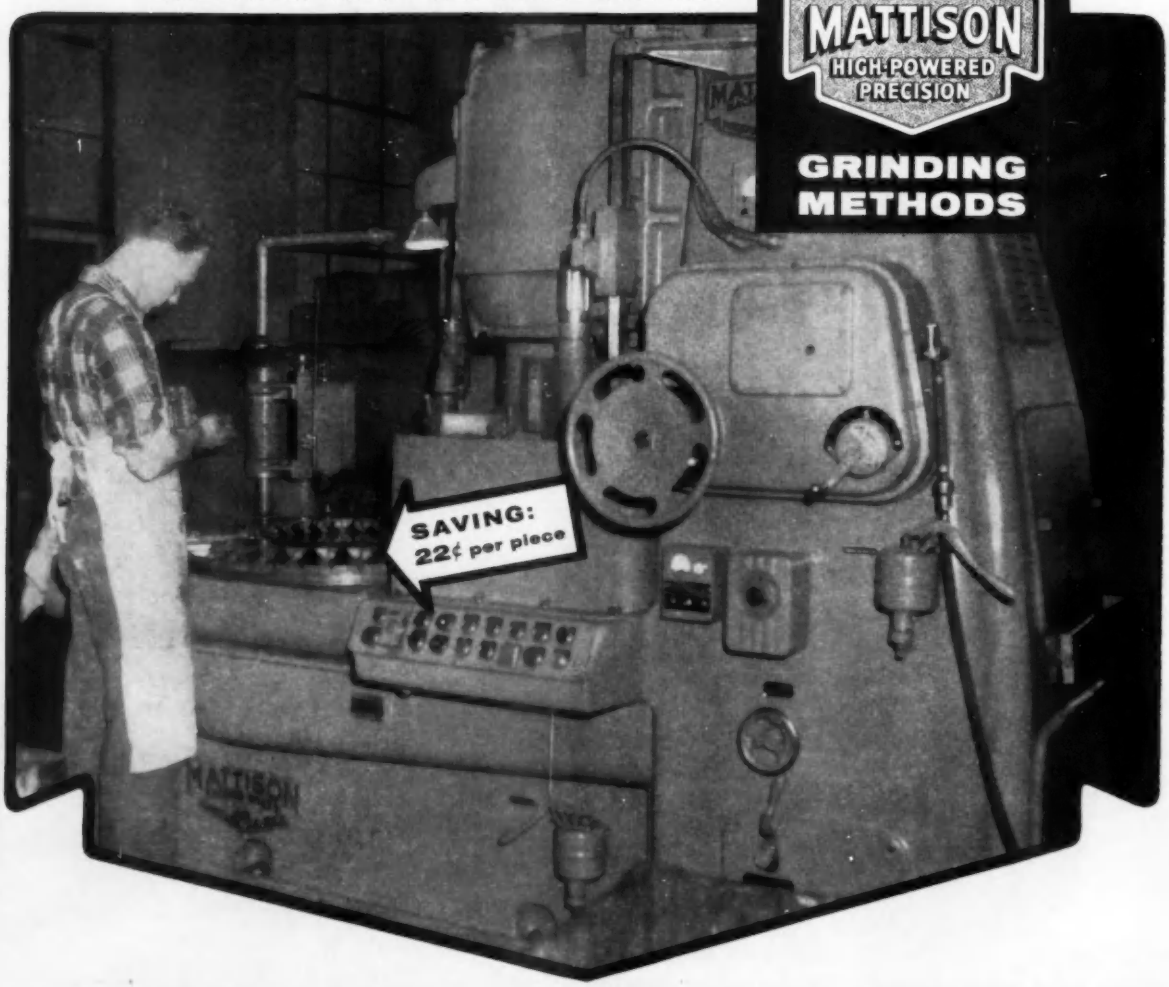
Compact, and power-packed—Waukesha 148-DKBS is a 6-cyl., 779 cu. in. Supercharged Diesel that has lively acceleration, clean burning, prompt starting, a tremendous reserve of power, and great overall economy. Waukesha's exhaust turbocharger system greatly increases horsepower—from 200 hp (of the normally aspirated 148-DKB) up to 280 hp at 2100 rpm in this Turbodiesel model. Send for Bulletin 1647.

WAUKESHA MOTOR COMPANY
Waukesha Wisconsin
New York • Tulsa • Los Angeles

50th ANNIVERSARY Waukesha MOTOR 1906-1956

300

CASE HISTORY NO. 32—FORGED STEEL CHAIN LINKS

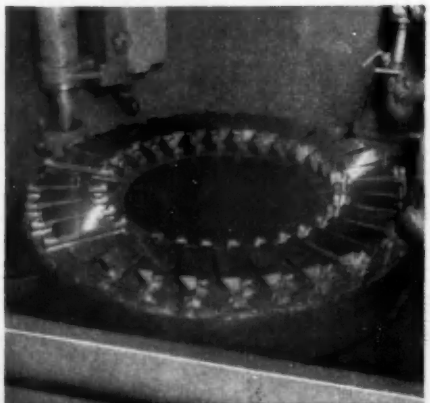


Change from milling to high-powered surface grinding saves 22¢ per piece!

Formerly, these 4140 drop-forged chain links were milled, 100 pieces every three hours, using high-speed steel cutters. Eighteen pieces were produced between sharpenings. At 35 minutes per sharpening, 3.2 hours of cutter maintenance were required for every three hours production at a labor cost of $16. This, plus machining cost of 15¢ per piece, gave a total cost of 31¢ each.

Today, links are machined, 30 pieces per load, at rate of 100 pieces per hour on the Mattison No. 24 Automatic Cycling Vertical Spindle Surface Grinder, equipped with 40 hp spindle motor. Stock removal is .140 in., at .016 in. minimum downfeed per minute. Wheel cost per piece is 4¢, but maintenance cost is eliminated because wheel is self-dressing. With a labor and machine cost of 5¢ per piece, total cost to grind is only 9¢—a saving of more than 22¢ per piece, plus additional savings in cost of cutters.

Mattison Vertical Spindle Rotary Surface Grinders offer continuous downfeed and automatic cycling and sizing of work, to machine large or small flat surfaces accurately and fast. Send your parts to the Mattison Methods Laboratory for a sample grind and production estimate.



Automatic sizer gauges parts continuously and stops automatic grinding cycle when finish size is reached.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.

HIGH-POWERED
PRECISION
SURFACE
GRINDERS

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

SEPTEMBER 15, 1956 — VOL. 115, NO. 6

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MEMBER — SBME Society of Business Magazine Editors

NBP National Business Publications, Inc.

ABC Audit Bureau of Circulations

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1. Cures "stick-slip" or "jumpy table". When a table gets the "shakes", especially after it has just reversed or when the load is heavy and the speed slow, it's probably suffering from "stick-slip". Remedy—Sunoco Way Lubricant®. Special polar compounds in Sunoco Way Lubricant form a friction-reducing film that keeps a table sliding smoothly under all operating conditions.

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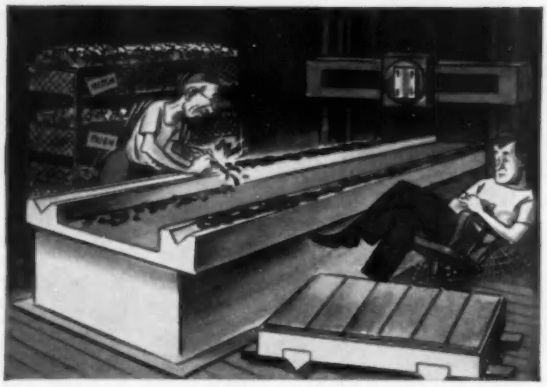

3. Protects expensive ways. Badly scored or pitted ways, caused by inadequate way lubrication, result in lost production and expensive repairs. The high film strength of Sunoco Way Lubricant eliminates the danger of metal-to-metal contact, the chief cause of scoring and way wear. Excellent metal-wetting and non-corrosive properties eliminate rusting and pitting.

For the lubrication of slides
and ways on this machine,
we recommend the use of
SUNOCO WAY LUBRICANT
a product of
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4. Approved by more than 55 machine-tool builders. Every major machine-tool builder has tested Sunoco Way Lubricant. It is always approved. In fact, to assure maximum efficiency of their product, many manufacturers ship a supply of Sunoco Way Lubricant with each machine. We'll be glad to send you the list of manufacturers who have approved Sunoco Way Lubricant.

For more information, see your Sun Representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-9

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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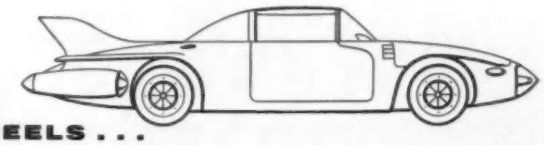
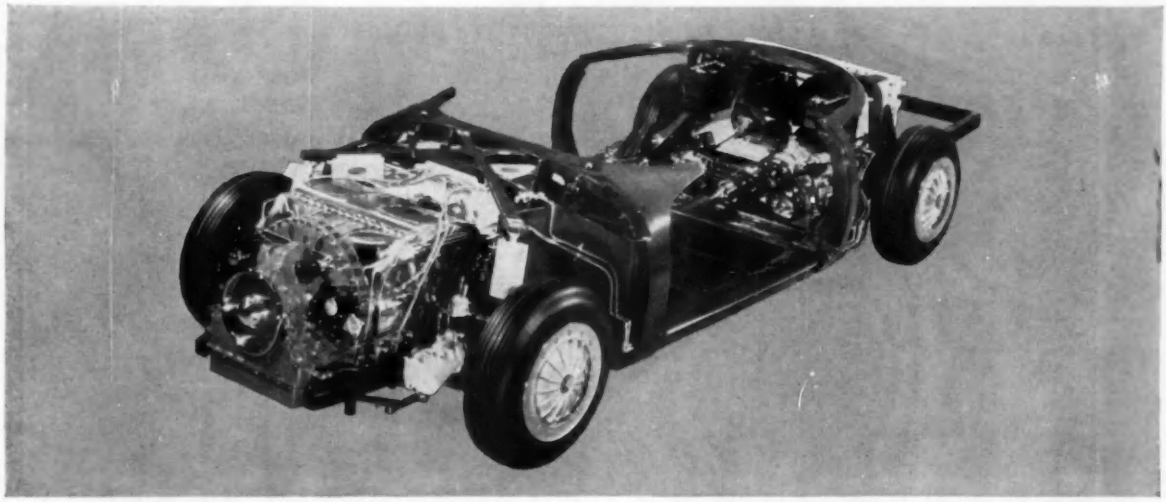
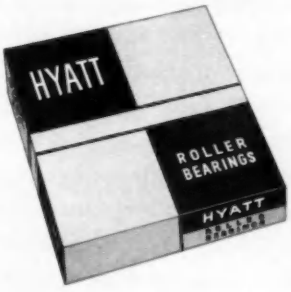
TO 2400 RPM AT THE WHEELS . . .





HYATTS SMOOTH THE FLOW OF POWER IN GM'S EXPERIMENTAL FIREBIRD II

Taming the terrific torque of this gas turbine developed by the GM Research staff is no job for ordinary bearings. Only the *finest* straight cylindrical roller bearings can stand the gaff!



HYATTS easily handle the whirlwind speeds generated, and at the same time let the turbine shafts float horizontally when they heat up. This "free lateral" feature automatically compensates for shaft expansion *without changing the bearing centers.* In the reduction gear train, too, HYATTS pass along the power with minimum frictional losses and maximum resistance to the punishing stress and strain.

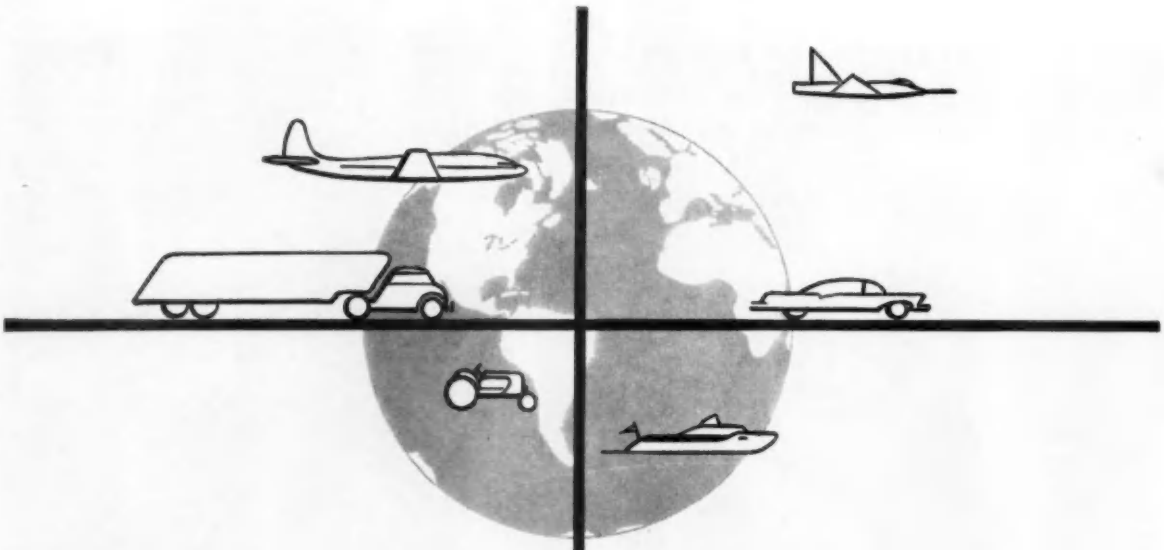
So if you've got a tough gas turbine bearing problem, come to HYATT for help. Remember . . .

HYATT has more experience with gas turbine applications of roller bearings than anyone else in the field—why not profit by it?

HYATT ROLLER BEARINGS

STRAIGHT ◯ BARREL ◯ TAPER ◯

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY



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with more than 400 products of the highest quality

Whether it be intricate die-castings, finely drawn magnet wire, electrical equipment for the automotive industry or any one of hundreds of other products . . . it is of the highest quality when it comes from Auto-Lite. This reputation for quality in 28 plants from Coast to Coast is maintained through central engineering control and is reflected in the public acceptance of the name Auto-Lite . . . and in the world-wide establishment of Auto-Lite service facilities.

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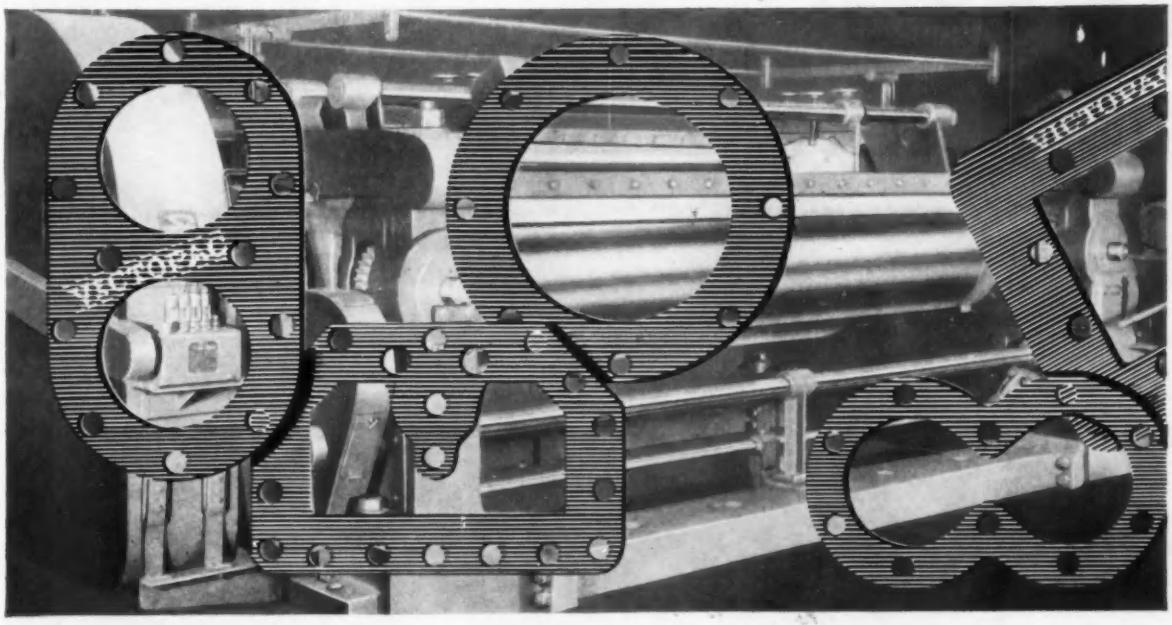


VICTOR doubles production of this versatile asbestos-synthetic rubber sheet packing

Sealing engineers agree on Victopac synthetic rubber and compressed asbestos sheet packing. Its known consistent performance on automotive and industrial applications has created unprecedented, still growing demand. By adding new specialized machinery, Victor has increased production and is now able to fill your orders promptly, whether for sheets or finished gaskets.

SERVICE RECOMMENDATIONS

Victopac is the proven economical specification for sealing hot or cold water . . . steam . . . vapor . . . combustion engine fuels, lubricants or coolants under high fluid and heavy flange pressures. It is a highly developed long-fiber asbestos-synthetic rubber composition, compressed and bonded under heat. In sheet form it is tough and completely homogeneous, with unlimited usefulness.

MEETS SAE-ASTM SPECIFICATIONS

In its several basic types, Victopac conforms to SAE-ASTM specifications G-1111, G-1122 and G-1123. Made in standard sheet thicknesses up to $\frac{1}{8}$"—in sheet sizes up to 58" x 62$\frac{1}{2}$".

TEST SAMPLE SHEETS SUPPLIED

Your inquiry invited for sample sheets. Please write on business letterhead, stating proposed application. See your Victor Gasket Engineering Catalog No. 505 for complete technical data.

Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. In Canada: Victor Mfg. & Gasket Co. of Canada Ltd., Victor Dr. and Chester St., St. Thomas, Ont.

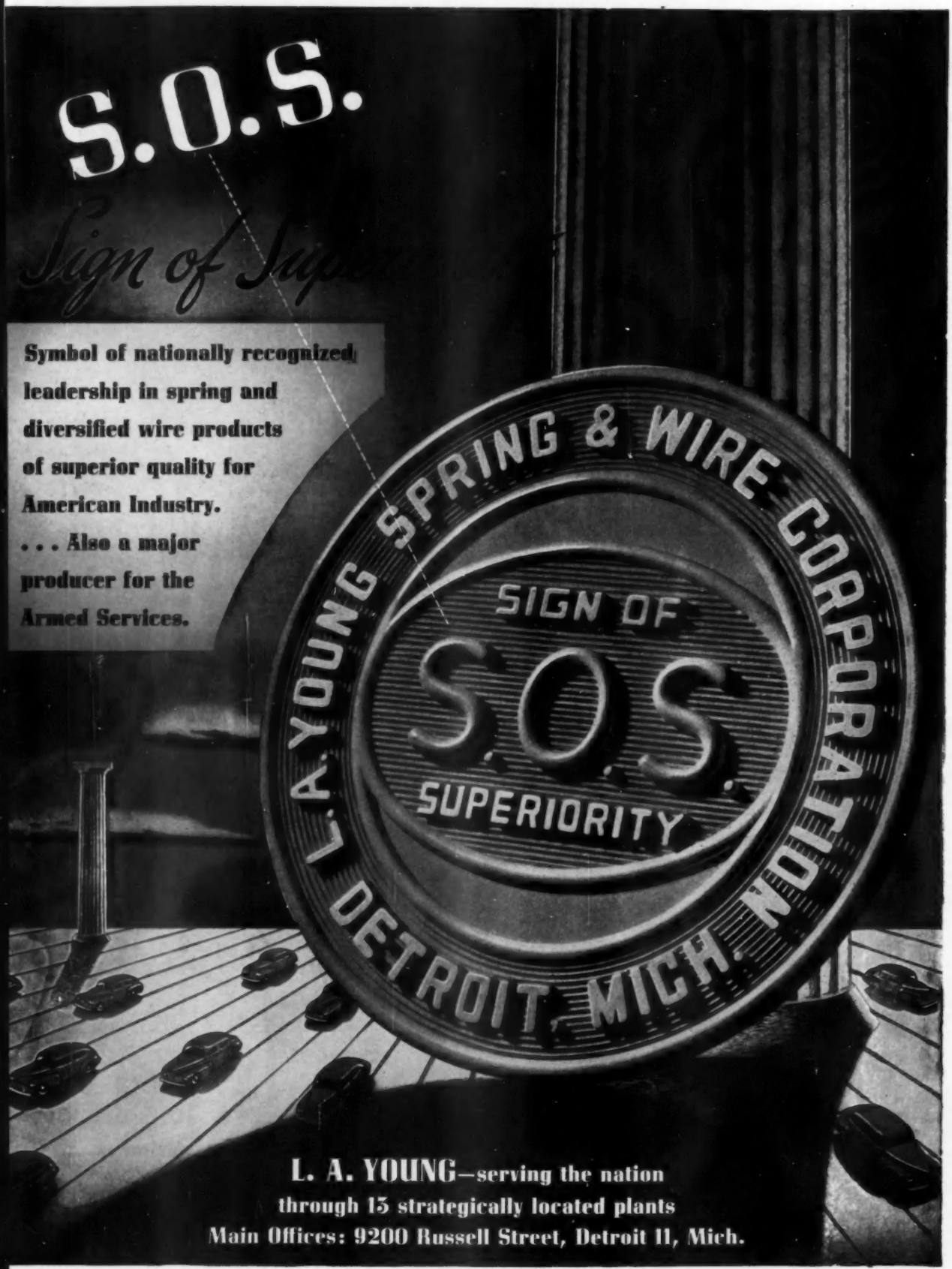
VICTOPAC CONDENSED SPECIFICATIONS

Type	SAE-ASTM Spec.	% Compression 5000 p.s.i. Load	Recovery %	Minimum Original Tensile	Max. Thickness Change in ASTM Oil No. 1—5 hrs. at 300° F.
1	G-1111-1	12 ± 5	40	1800 p.s.i.	20%
1	G-1111-2	20 ± 5	40	1250 p.s.i.	20%
1B	G-1111-1	12 ± 5	40	1800 p.s.i.	20%
2 Graphite coated, one side	G-1111-1	12 ± 5	40	1800 p.s.i.	20%
3 Graphite coated, two sides	G-1111-1	12 ± 5	40	1800 p.s.i.	20%
50V	G-1122-1	12 ± 5	40	2000 p.s.i.	10%
60V	G-1123-1	12 ± 5	40	2000 p.s.i.	15%

VICTOR

Sealing Products *Exclusively*

GASKETS • OIL SEALS • PACKINGS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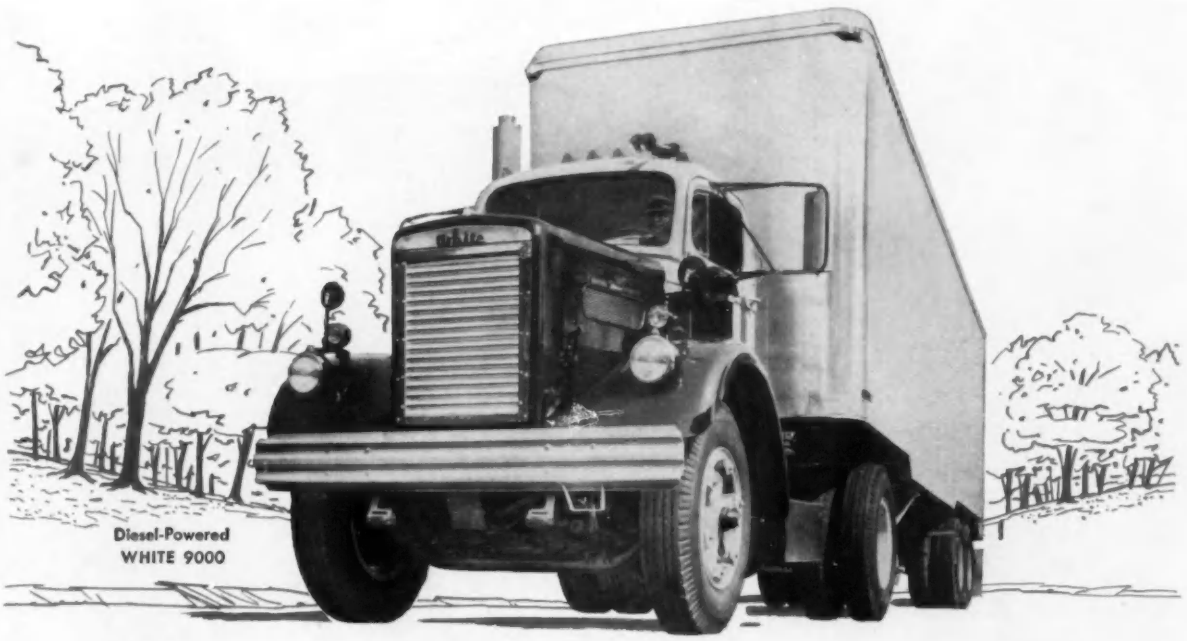


ANOTHER NEW WHITE ...STEERED BY ROSS

Ross

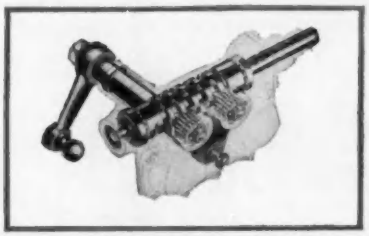
STEERING

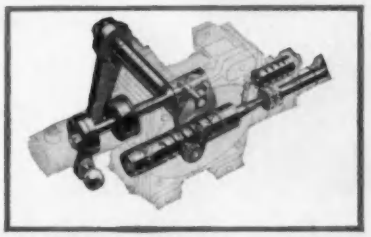
● **New WHITE 9000** with 90-inch dimension from front of bumper to back of cab for maximum "L" dimension. Handles 35 ft. square-nose trailer within 45 ft., or 40 ft. trailer within 50 ft. limit, with three different king pin settings—24″, 30″ and 36″.

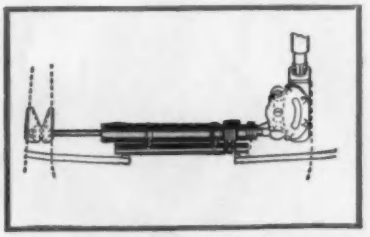
Another outstanding feature that helps make the WHITE 9000 a brilliant new "dimension" in truck-power is — easy, safe, economical *ROSS Steering*.

For 50 years Ross has anticipated and met the *everchanging* needs of the industry for new, finer steering performance, safety and economy. Ross invites discussion of *any* steering problem—manual or power.

ROSS GEAR AND TOOL COMPANY, INC. • LAFAYETTE, INDIANA







CAM & LEVER MANUAL . . . HYDRAPOWER INTEGRAL . . . HYDRAPOWER LINKAGE

Essex Wire Corporation Battery Cable—
Made of Kaiser Aluminum—
provides saving of 14%

American Motor Corporation engineers, alert for ways to reduce costs without reducing quality and performance, have standardized on aluminum battery cable for Rambler, Nash and Hudson cars.

Aluminum cable, supplied by Essex Wire Corporation, Detroit, weighs only half as much as copper and *provided an initial cost reduction of over 14%.* Aluminum's light weight also makes possible additional savings in shipping costs and contributes to over-all weight reduction.

This all new aluminum battery cable was engineered,

and designed to supply equal current carrying capacity and lower resistance than equivalent copper cable.

This is one more example of how versatile aluminum . . . combined with sound engineering . . . can improve quality and reduce costs in the automotive industry.

Make our automotive development engineers your *"idea partners."* Combine your knowledge of your product with our experience with aluminum to help you obtain maximum improvements and savings.

Also, if you need assistance in finishing, welding, forging, roll-forming, extrusions, stampings, castings—or desire engineering service or fabricating counsel—our development engineers will gladly provide it.

Call our *Automotive Development Division,* TRinity 3-8000, Kaiser Aluminum & Chemical Sales, Inc., 1414 Fisher Bldg., Detroit 2, Michigan. *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.

RELIANCE DRIVES NEW MILLING MACHINE

This unique milling machine designed for milling big aircraft parts operates exactly like a huge arm. Its cutter swoops in and out at the touch of the joy stick control. The direction in which the stick is pushed is the direction of the head movement. The harder the push the faster the movement.

This unusual feed drive is made possible by a Reliance V★S Drive. Two 7½ hp. Variable Speed D-c. Motors, one each at shoulder and elbow, provide the flexible arm-like feed movements. The motors are controlled and directed by the joy stick.

The result is an extremely compact and versatile feed drive that gives eye-popping performance. Economical in original cost, these Reliance Drives will provide years of steady service with little maintenance.

If you are designing, building or buying machine tools, it will pay you to check the economies of Reliance Variable Speed Drives. A-1516

Write for Bulletin D-2311

RELIANCE V★S DRIVE®

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 59A, CLEVELAND 18, OHIO • CANADIAN DIVISION: WELLAND, ONTARIO
Sales Offices and Distributors in Principal Cities

Why LINK-BELT timing chains assure

factory-engineered timing

throughout thousands of miles of car operation

Get All 3

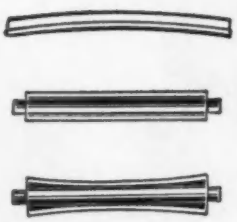
- AUTOMATIC JOINT SNUGNESS
- SMOOTHER OPERATION
- LONGER LIFE

Factory-set valve timing is closely maintained during thousands of miles of car operation with precision Link-Belt Timing Chain. Segmental bushings automatically provide for snug joints, reducing "slap" on the non-load side. And this—together with the built-in anti-back-bend feature—is Link-Belt's answer to smoother operation, long life and peak timing drive performance.

Link-Belt can call on 45 years of experience in applying timing chains to internal combustion engines. In addition, our research staff continually tests timing chains on current engines, working with modern facilities similar to those of your own engine designing laboratories. As a result, Link-Belt is thoroughly prepared to furnish a test drive and work with you in applying it to your design.

Specifications and information for layout work, etc., are contained in Book 2065. Write for your copy.

Segmental bushings provide automatic joint snugness



Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

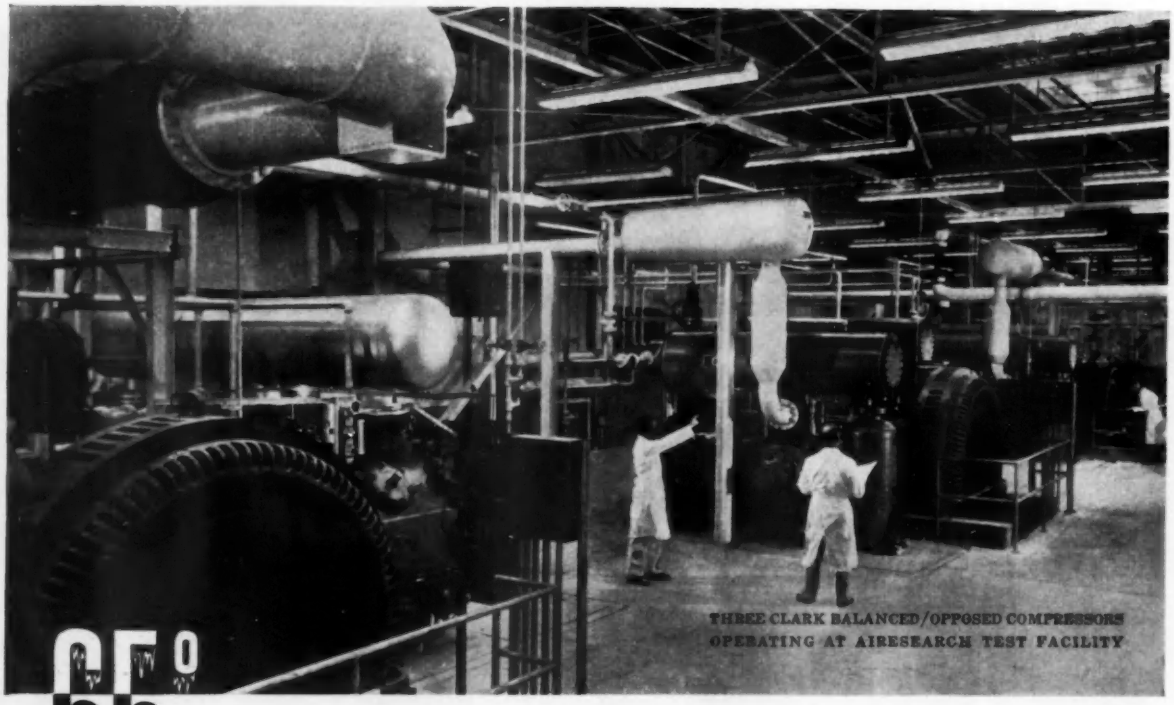
Bow in bushings acts to keep a snug joint on non-load side, maintaining chain pitch automatically.

ANOTHER LINK-BELT EXCLUSIVE — Built-in check in joints allows forward articulation for engagement with sprockets . . . prevents back-bend and whip.

LINK-BELT

TIMING CHAINS AND SPROCKETS

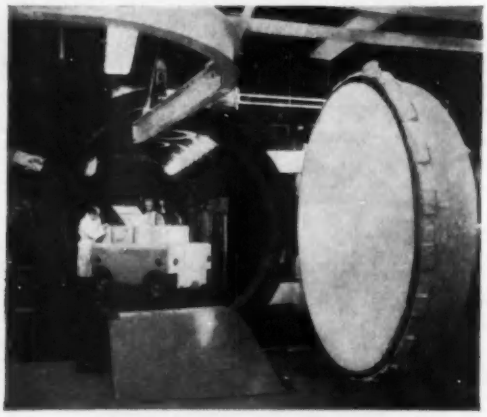
LINK-BELT COMPANY, 220 South Belmont Ave., Indianapolis 6, Ind.



THREE CLARK BALANCED/OPPOSED COMPRESSORS OPERATING AT AIRESEARCH TEST FACILITY

65° below zero in the middle of the desert

Clark Air Compressors furnish the power



GIANT ALTITUDE CHAMBER FOR HOT AND COLD TESTS

Mass production testing of aircraft components such as air turbine starters, refrigeration turbines and other units was what the AiResearch Division of the Garrett Corporation wanted. To meet this need, they built giant test facilities next to their factory in the middle of the Arizona desert at Phoenix featuring seventy-five test cells.

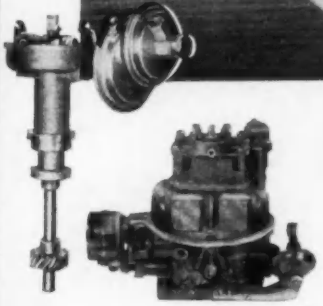
To provide most of the air to operate test equipment AiResearch installed three Clark Model CRA-4 Balanced/Opposed Motor-Driven-Compressors having a combined rating of 4750 horsepower. Up to 42 tons of air per hour can be delivered. Temperatures range from a frigid −65° to a blistering 1000°F while pressures of from vacuum to 1000 psi can be provided.

For your air needs in the 150-4500 horsepower range, Clark has an ultra modern Balanced/Opposed Compressor to fit every application. Your nearest Clark representative will give you complete information or write for Bulletin 118.

CLARK BROS. CO., OLEAN, N. Y.
One of the Dresser Industries
Offices in Principal Cities Throughout the World

CLARK®

Balanced/Opposed Air Compressors

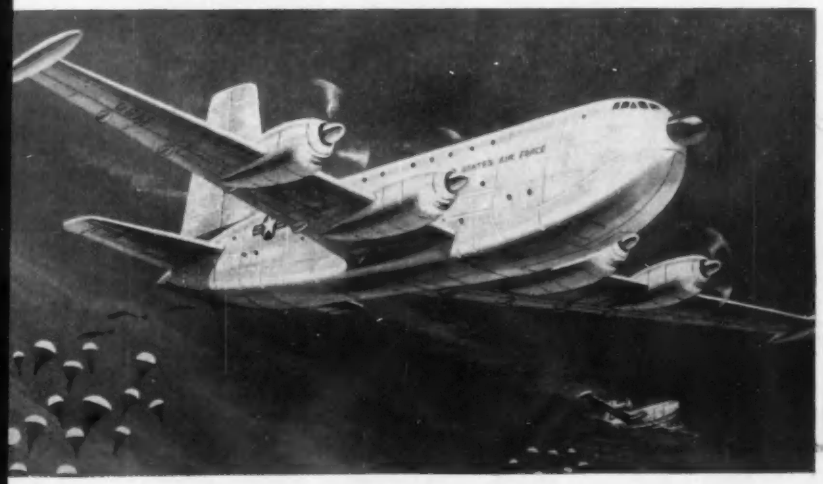


IN AUTOMOBILES—over 10 million of them—you'll find Holley carburetors and distributors. Holley's outstanding record of "firsts" in this field includes the 4-barrel carburetor with vacuum controlled secondary barrels.

IN TRUCKS. More of America's truck engines are Holley carburetor equipped today than are equipped with any other carburetor. Leading truck manufacturers combine Holley's carburetor, distributor and governor for an integrally-designed control system which provides maximum power and maximum economy features.

Engine Control Systems by Holley

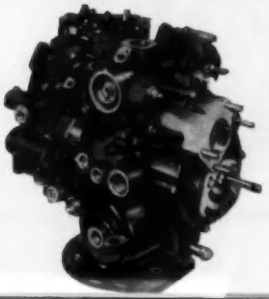
"Mechanical Brains" to Control the Power of the Engines of America



Effective control of engine power is not a simple process of fuel metering—rather it is a problem of co-ordinating the many variables in such a way that the pilot's or driver's demand is instantly satisfied in the optimum manner.

For over half a century, Holley has supplied control systems to harness the power of automobile, truck and aviation engines of all types. Holley carburetors and distributors for automobiles and trucks, and turbine controls for jet aircraft provide maximum efficiency and minimum operating costs for today's engines.

Wherever control systems are needed — for auxiliary or main power plants — Holley's half a century of design, engineering and manufacturing experience can best meet your requirements.



IN AIRCRAFT—jet fighters, bombers, and huge airliners of the future—power control systems by Holley automatically make engine adjustments for busy pilots.

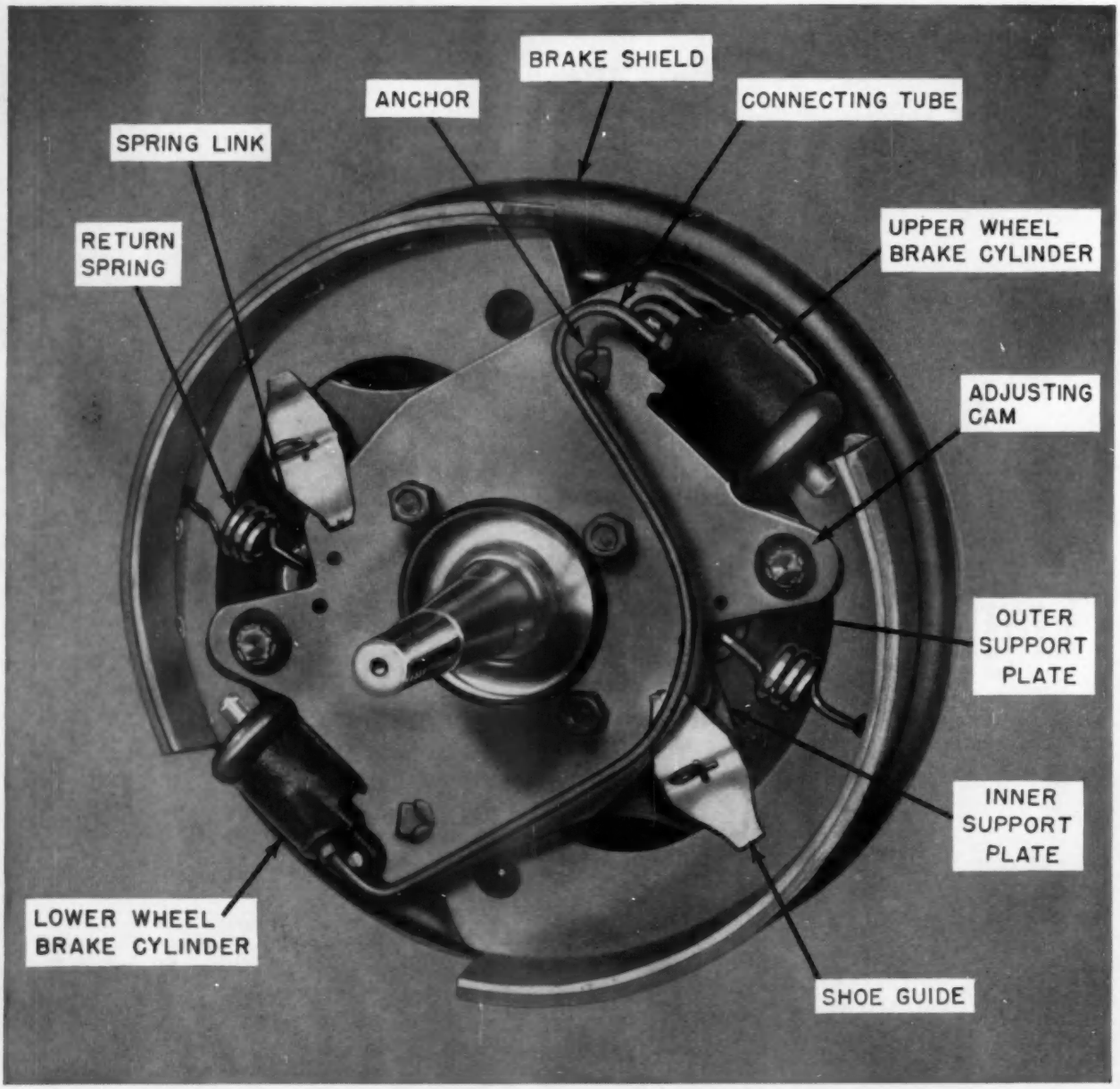
HOLLEY Carburetor Co.

FOR MORE THAN HALF A CENTURY —ORIGINAL EQUIPMENT MANUFACTURERS FOR THE AUTOMOTIVE INDUSTRY.

11955 E. Nine Mile Road, Van Dyke, Michigan

1-24

Bundyweld Tubing specified



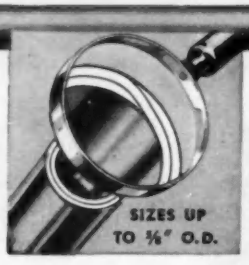
WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniformthickness,and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, doublewalled and brazed through 360° of wall contact.



←

NOTE the exclusive Bundy-developed beveled edges, which afford asmootherjoint, absence of bead, and less chance for any leakage.

11955 E. Nine Mile Road, Van Dyke, Michigan

by Chrysler for advanced, new center-plane brakes

Dependable double-walled steel tubing is used in 95% of today's cars, in an average of 20 applications each

Chrysler's famous *FORWARD LOOK* is more than skin-deep. One of the unseen advances is in its new center-plane brakes, where mechanical linkage has been replaced by an ultra-dependable internal hydraulic system. From brake pedal to brake shoe, the Chrysler's "stopping" power now relies on Bundy® Tubing.

Fuel, lubrication, brake, or control lines—you just can't beat Bundyweld for strength and dependability. Used on all major automobiles, it is the tubing standard of the industry.

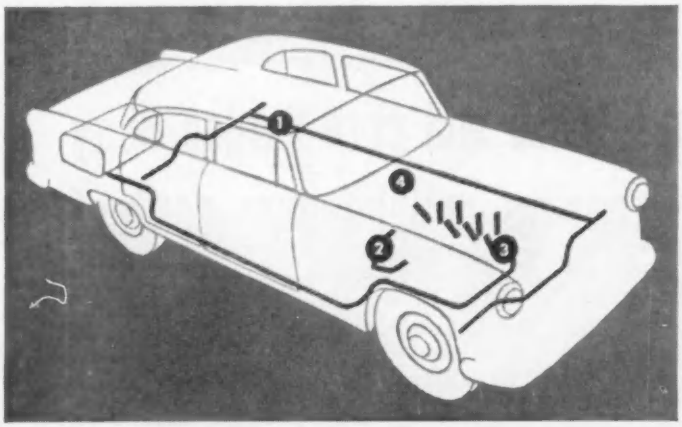
Bundyweld is leakproof by test; thinner walled yet stronger; has high bursting strength; takes easily to standard protective coatings; has high fatigue limits. It's the only tubing double-walled from a single metal strip; copper-brazed throughout 360° of double-walled contact.

In addition, Bundy offers you unexcelled fabrication facilities, expert engineering services; custom packaging of orders; prompt, *on-schedule* deliveries. Whether you fabricate your own parts or want us to do the job, we're equipped to handle your order—exactly to your specifications.

Call, write, or wire today for complete information or for specific help with your problem.

BUNDY TUBING COMPANY • DETROIT 14, MICH.

BUNDYWELD STEEL TUBING—"LIFELINES" OF YOUR CAR



1

Bundyweld lifelines in your car's hydraulic brake system are *many times stronger than necessary to save your life.*

2

Leakproof Bundyweld helps keep oil where it belongs in your car—with no delays, costly repairs, ruined engine.

3

Fuel lines of Bundyweld won't fail you, despite constant beating from flying rocks, punishing vibration.

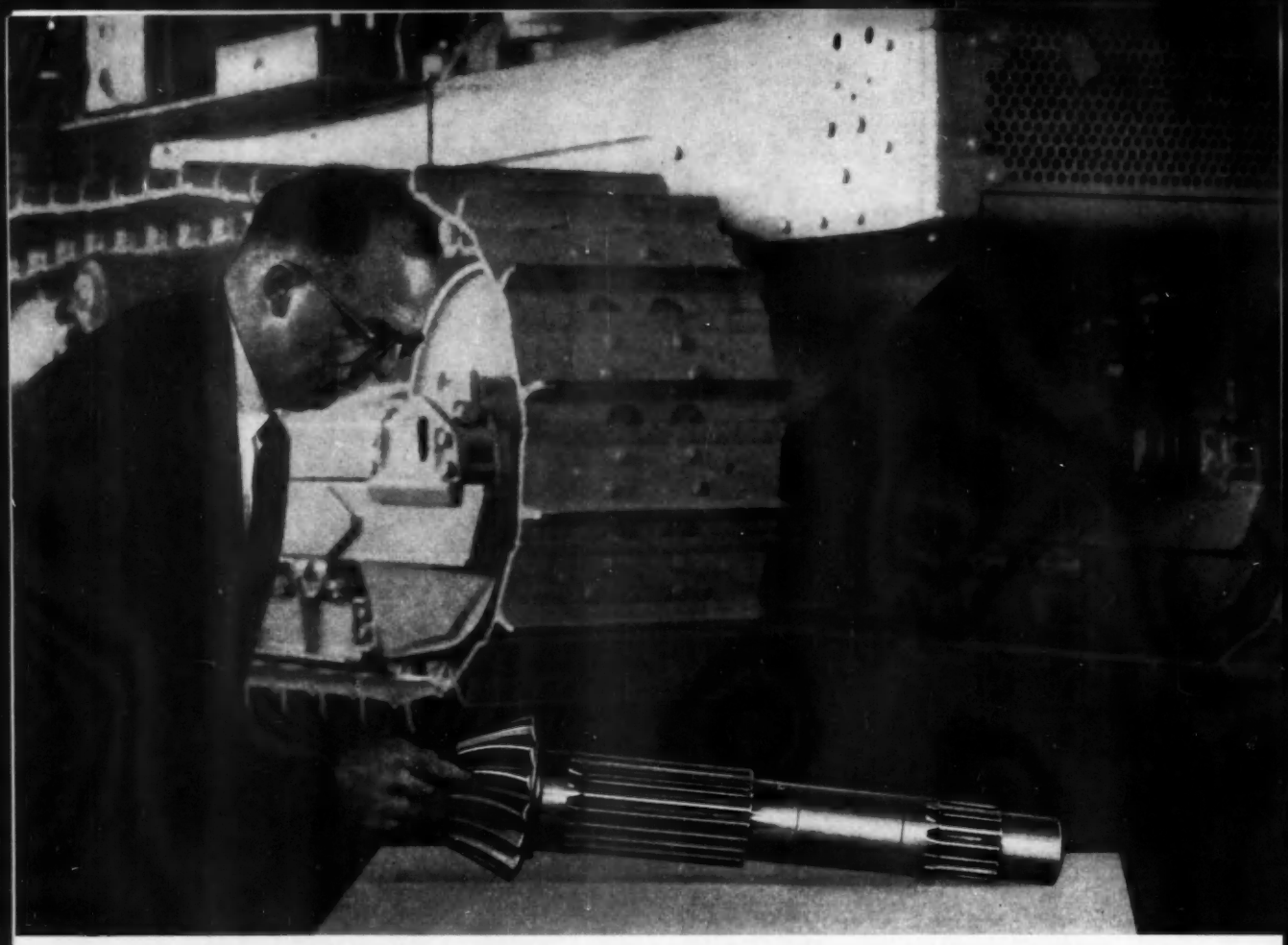
4

To help keep push-button windows foolproof, manufacturers depend on Bundyweld to conduct the hydraulic fluid.

BUNDYWELD® TUBING

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • *Chattanooga 2, Tenn.:* Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • *Chicago 32, Ill.:* Lapham-Hickey Co., 3333 W. 47th Place • *Elizabeth, New Jersey:* A. B. Murray Co., Inc., Post Office Box 476 • *Los Angeles 58, Calif.:* Tubesales, 5400 Alcoa Ave. • *Philadelphia 3, Penn.:* Rutan & Co., 1717 Sansom St. • *San Francisco 10, Calif.:* Pacific Metals Co., Ltd., 3100 19th St. • *Seattle 4, Wash.:* Eagle Metals Co., 4755 First Ave., South *Toronto 5, Ontario, Canada:* Alloy Metal Sales, Ltd., 181 Fleet St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**



Caterpillar Tractor Co. Metallurgist T. H. Spencer inspects final drive pinion for D9 crawler tractor weighing 28 tons. Severe loading of this large pinion requires a steel with high case and core hardenability. Several years ago Caterpillar Tractor Co. found that simply by increasing the molybdenum content of AISI 8622 (to 0.30-0.40%), the desired properties were obtained at lower cost than was possible in any of the standard carburizing grades.

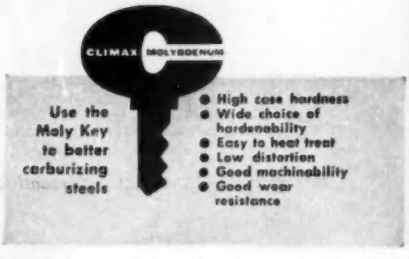
Caterpillar Tractor Co. improves case and core hardenability of carburizing steel by increasing molybdenum content

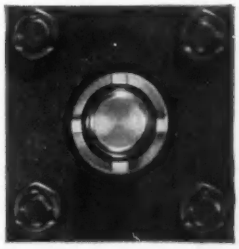
"Drive pinions in tractors must take very high torque loads," says T. H. Spencer, Metallurgist for Caterpillar Tractor Co. "AISI 8622 steel, which we had been using, couldn't give us the hard case and strong, tough core we needed in these heavy sections. Other standard carburizing steels with the requisite properties would have cost substantially more. We found, however, that we could achieve the desired surface and core properties by simply modifying AISI 8622 with a higher percentage of molybdenum. We have been using this composition for several years, and results have been excellent."

Caterpillar Tractor Co.'s experience shows how increasing molybdenum in a carburizing steel helped to solve a specific problem. Perhaps your product, too, can benefit by higher molybdenum content.

A technical article, "New Carburizing Steels for Critical Gearing", describes some recent investigations of higher-moly carburizing steels. For a reprint, write Climax Molybdenum Company, Dept. 4, 500 Fifth Avenue, New York 36, N. Y.

CLIMAX MOLYBDENUM





Here are the world's finest power cylinders

...competitively priced!

This ad is written for the man who has thought all cylinders are "pretty much alike." That just isn't so, and your Hannifin man would like an opportunity to show you why...

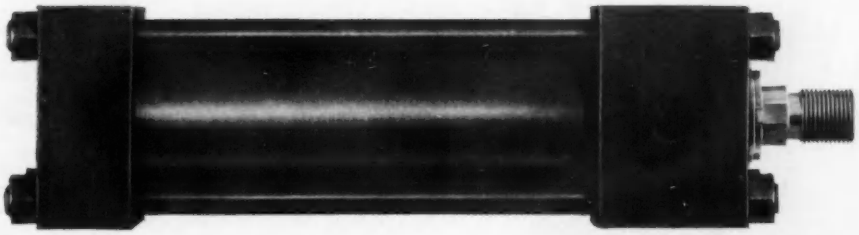
He'll show you design features that other cylinders simply do not have... extra quality workmanship at critical points that pays off in longer life ...accessibility that simplifies their infrequent maintenance. And when he talks price and delivery, you will find these better features cost you no more, can often be delivered sooner.

We think you'll agree that it pays to standardize on Hannifin cylinders.

AIR AND HYDRAULIC

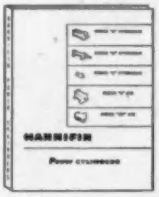
HANNIFIN

POWER CYLINDERS



COMPLETE CYLINDER FILE

Write for your copy of this new Hannifin Cylinder File . . . complete, easy-to-use, easy-to-order-from information on five lines of Hannifin Cylinders. Write Hannifin Corporation, 543 S. Wolf Road, Des Plaines, Ill.



GISHOLT

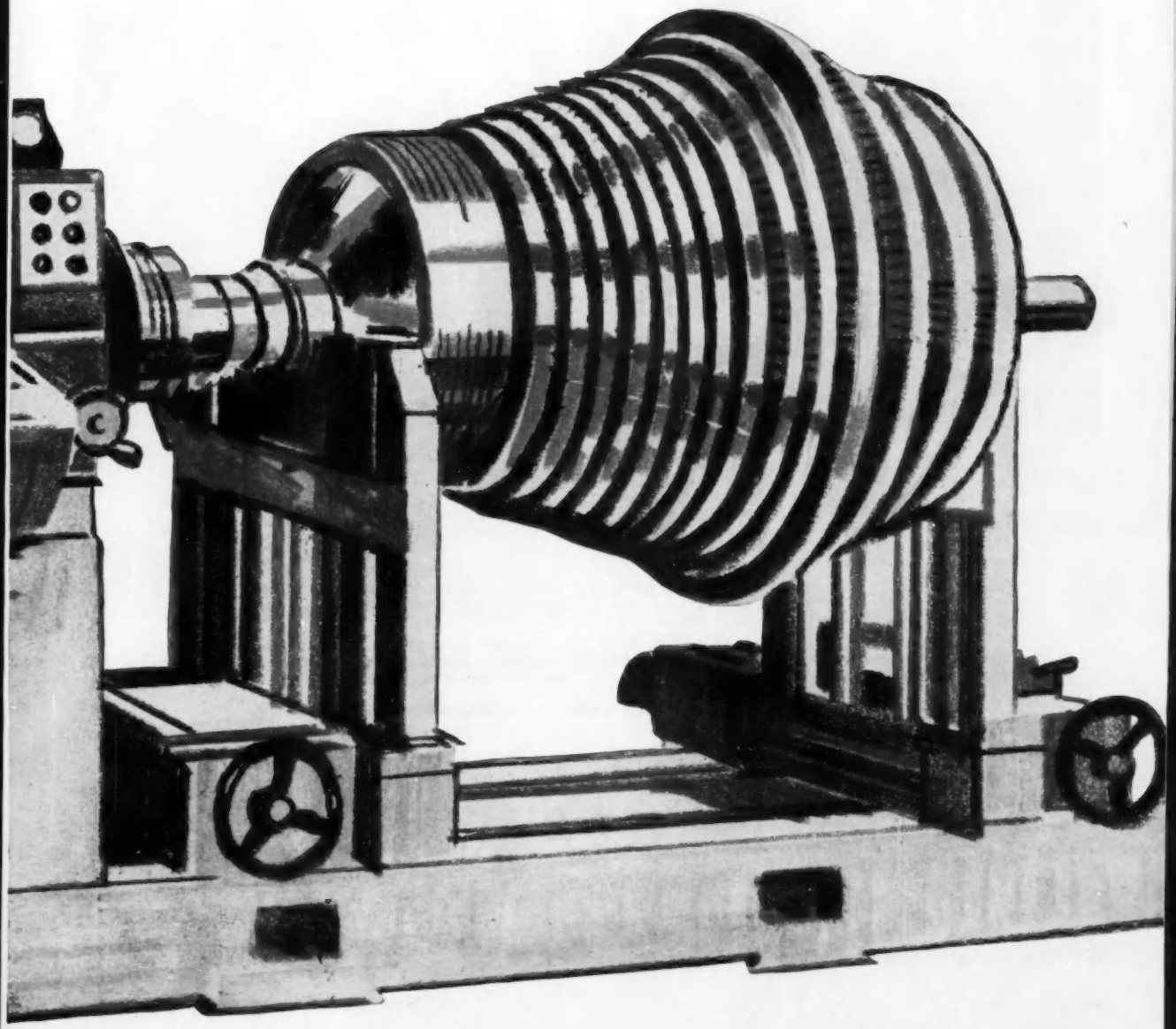
GISHOLT DYNETRIC TYPE "U" BALANCER

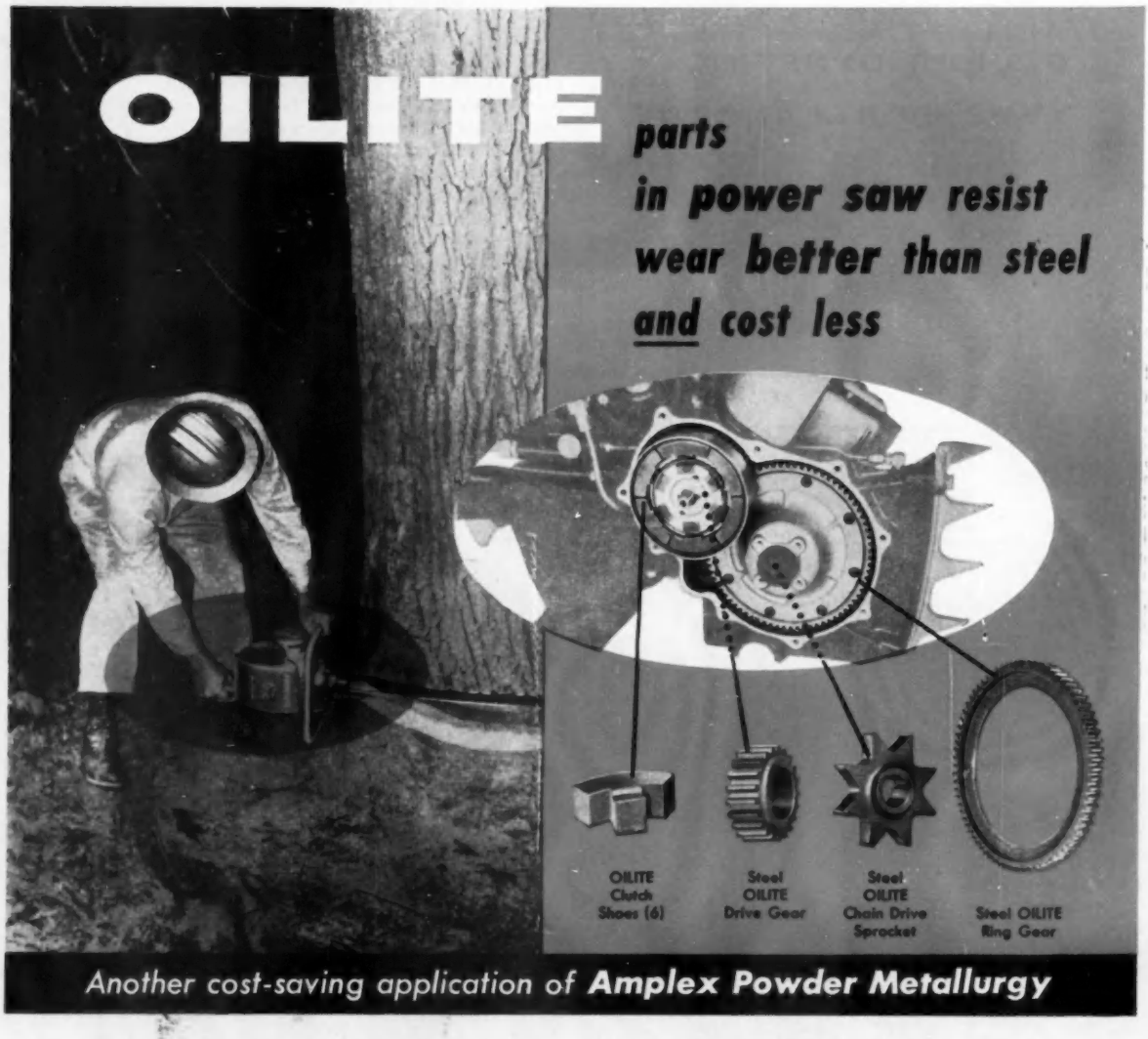
MASTERLINE GISHOLT SINCE 1887

This latest design Gisholt DYNETRIC Type "U" Balancer has many outstanding features for quicker setup and faster, easier operation. Unbalance effects are accurately measured and located by unskilled operators. No computation is required—no charts or graphs. In short, here is a truly advanced design for better work at lower cost. If you're interested in the balancing of rotating parts or assemblies, large or small, we would like to tell you about these new machines—and show you how they may be applied profitably to your manufacturing processes.

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt





With a modern power saw—easy does it. It's easier on the inside, too, because this manufacturer has equipped vital components with extra tough, greater wear resistant OILITE precision parts. The manufacturer's report indicates that OILITE powder metal sprockets and gears offer *greater wear resistance than alloy steels.*

Furthermore, in using OILITE precision parts the manufacturer of the power saw realizes *substantial cost savings over parts fabricated by any other process.*

What this manufacturer is accomplishing with OILITE precision parts, you can too. Or, perhaps, in your case OILITE self-lubricating bearings and bearing materials can help you lick the problem of providing lubrication in hard-to-get-at places. In permanent metal filters, too, OILITE provides a wide choice of shapes, sizes and porosities to meet product requirements.

Amplex—volume producer of Chrysler-engineered powder metal components—can meet your production schedules with on-time deliveries in any quantity.

Helping solve the problem of others is a daily occurrence at Amplex. This Chrysler-Amplex engineering service is available to you too.

Representatives and dealers located in principal cities in United States and Canada.

A CHRYSLER OILITE PRODUCT

Only Chrysler Makes **OILITE**

AMPLEX DIVISION

CHRYSLER CORPORATION • DETROIT 31, MICHIGAN

Yours! Free!

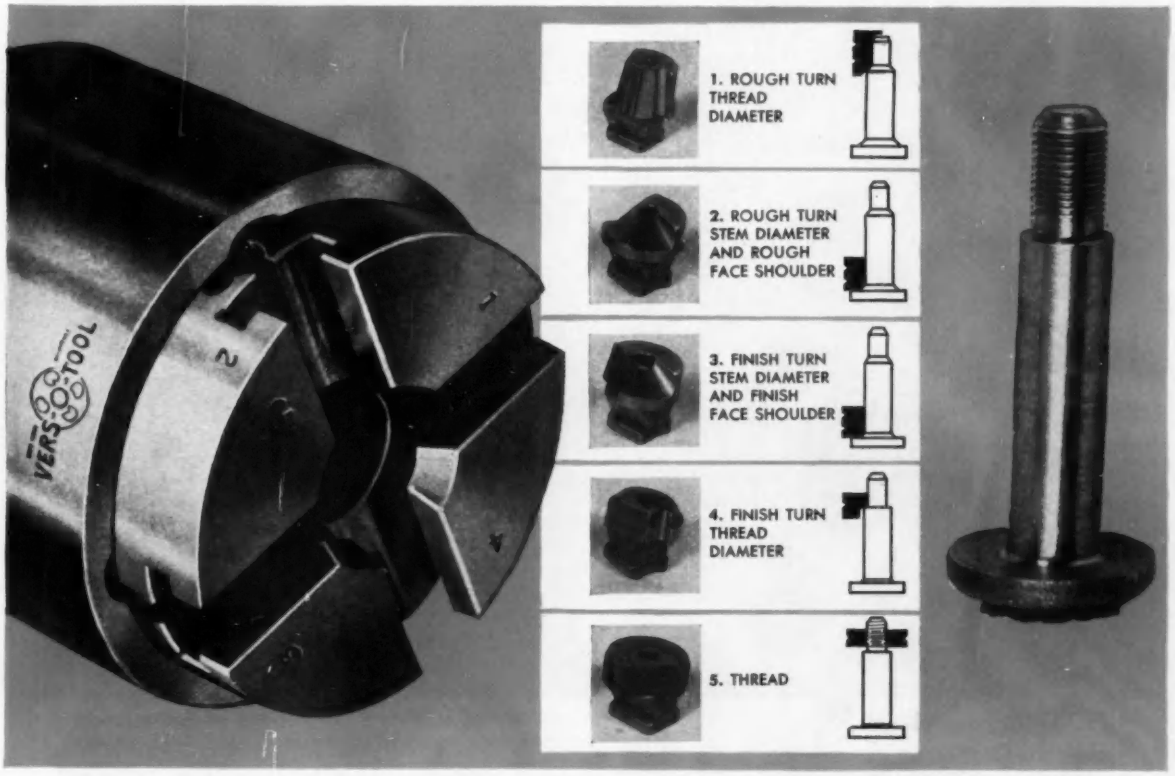
New 52-page OILITE Engineering Manual. Supplies valuable engineering data and application information on OILITE powder metal bearings, parts and filters. Ask for Manual E-56. Write: Dept. J.

Bearings • Finished Machine Parts • Permanent Metal Filters • Friction Units

HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

SEND FOR THIS CATALOG DT-52

the National Acme company

173 EAST 131ST STREET • CLEVELAND 8, OHIO

need creative automation assistance?

investigate W. F. & JOHN BARNES TWO-FOLD AUTOMATION SERVICE

1 ENGINEERING COMPLETE PRODUCTION-LINE SYSTEMS

Complete service includes planning step-by-step sequence of operations and the individual engineering of processes, methods and equipment to meet your production needs. Barnes' creative engineering, developed over a period of 80 years in designing and building high production machine tools, can be depended upon to provide you with the latest in cost-cutting methods. Our highly versatile engineering staff will work with you as a team to solve problems quickly and efficiently.

2 DESIGNING AND BUILDING SPECIAL UNITS

To meet specific work-handling or processing needs, Barnes' engineers have designed and built special conveyors, turnover mechanisms, inspection, and assembling equipment to suit either automatic or semi-automatic requirements. Hundreds of units are today profitably serving a wide range of industries. Because electrical, hydraulic, mechanical, tool and fixture engineering is closely coordinated at Barnes under one roof, you save time and eliminate divided responsibility.

Write for Free Literature

Ask for Production Analysis

Find out today why more and more production executives are turning to Barnes for help with their automation problems. Barnes' creative engineering staff will be pleased to analyze your requirements, offer recommendations, and provide you with a cost estimate in a formal proposal, if you desire.

Builders of Better Machines and Equipment since 1872

W. F. & JOHN BARNES

AUTOMATION SECTION

425 S. WATER ST. • ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

Continuous, high-speed sheet levelling calls for continuous, precision lubrication

FARVAL—
Studies in Centralized Lubrication
No. 192

● Wherever high speed and heavy shock loads are involved, adequate lubrication of bearings is a must. It can't be a hit-and-miss proposition—there's too much at stake with costly machines and continuous production lines. The operation above is a good example. Here an Aetna-Standard sheet leveller flattens sheets at high speed. Failure or inaccuracy interferes with succeeding forming and stamping operations. With Farval on guard, such eventuality will not occur.

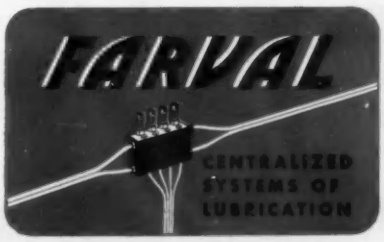
Farval delivers a measured amount of clean lubricant to every bearing at regular intervals. No bearings are ever missed—and the amount delivered to any bearing can be varied without affecting the rest of the system. Farval saves production hours, maintenance, labor.

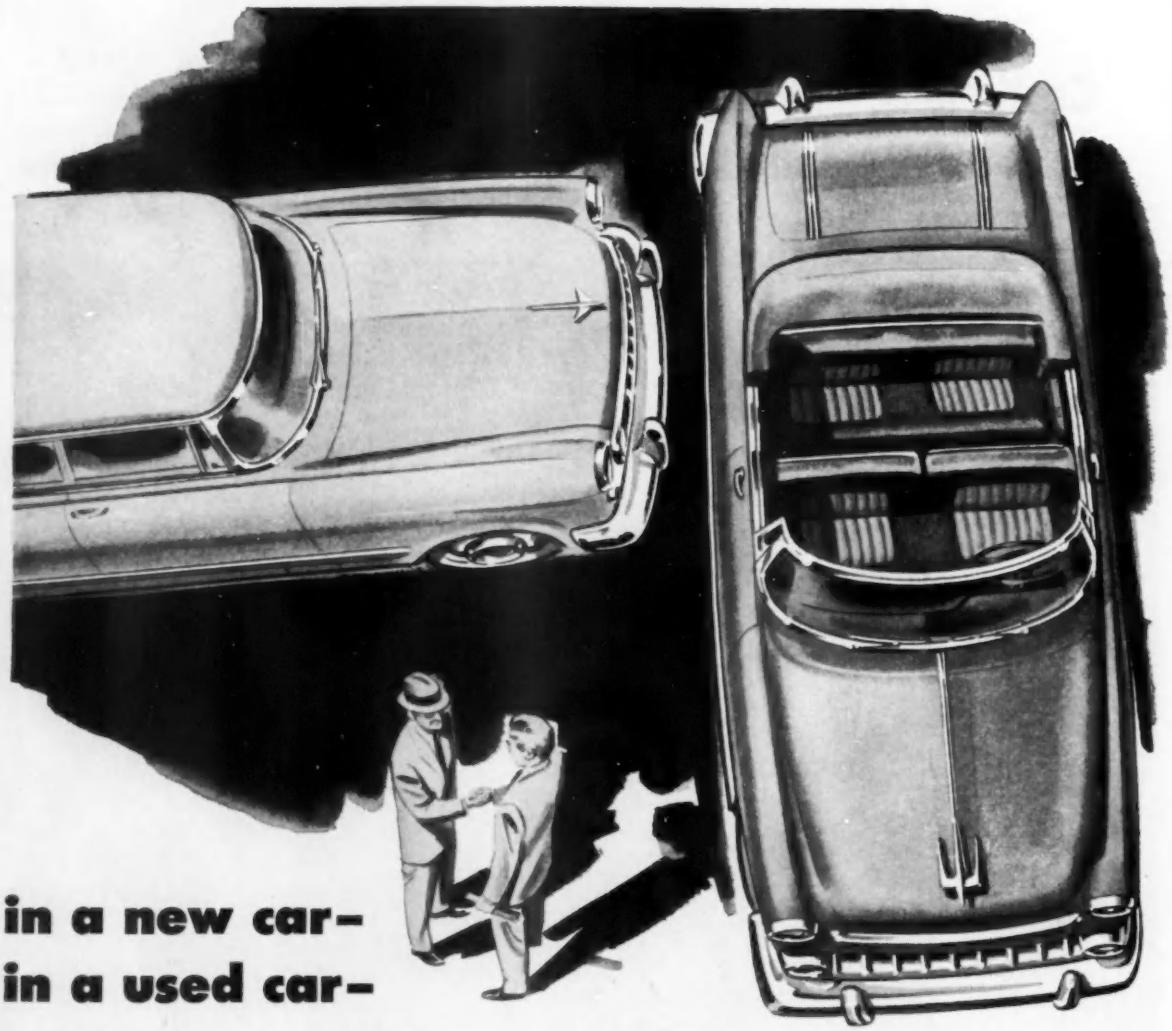
Ask, now, for a free lubrication survey. Let us send one of our lubrication engineers to inspect your plant equipment. Without obligation, he will present a written analysis of what Farval can do for you. Write the Farval Corporation, 3296 E. 80th St., Cleveland 4, O.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.

KEYS TO ADEQUATE LUBRICATION—
Wherever you can see these Farval manifolds, duel lubricant lines and central pumping station, you know a machine is being properly lubricated.

Here, Farval serves an Aetna-Standard leveller in an Ohio metalworking plant.





in a new car–
in a used car–

Stainless Steel sells and re-sells!

The Stainless Steel trim, molding and vital parts that add style and beauty to a car, inside and out, are features that help make the sale.

Stainless Steel has wide customer acceptance. It's easy to clean and keep clean. It's a tough, solid metal that will not corrode or dent and stands up to gravel, ice, salt and water.

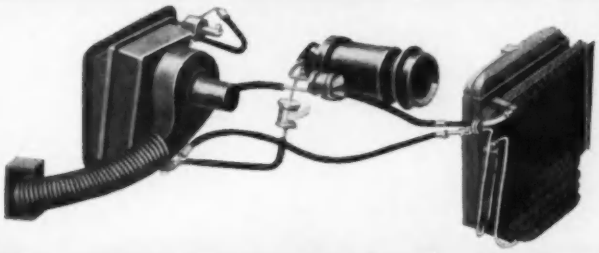
The finish never fades and parts are easy to replace. Stainless Steel lasts the life of the car. It *sells* in a new car and it *re-sells* in a used car.

McLOUTH
STAINLESS
STEEL
for automobiles

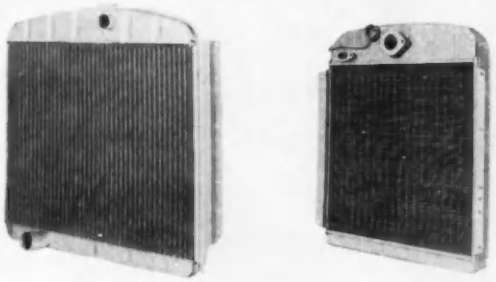
McLOUTH STEEL CORPORATION, *Detroit, Michigan, Manufacturers of Stainless and Carbon Steels*

TEMPERATURES
MADE
TO
ORDER

Temperatures made to order!



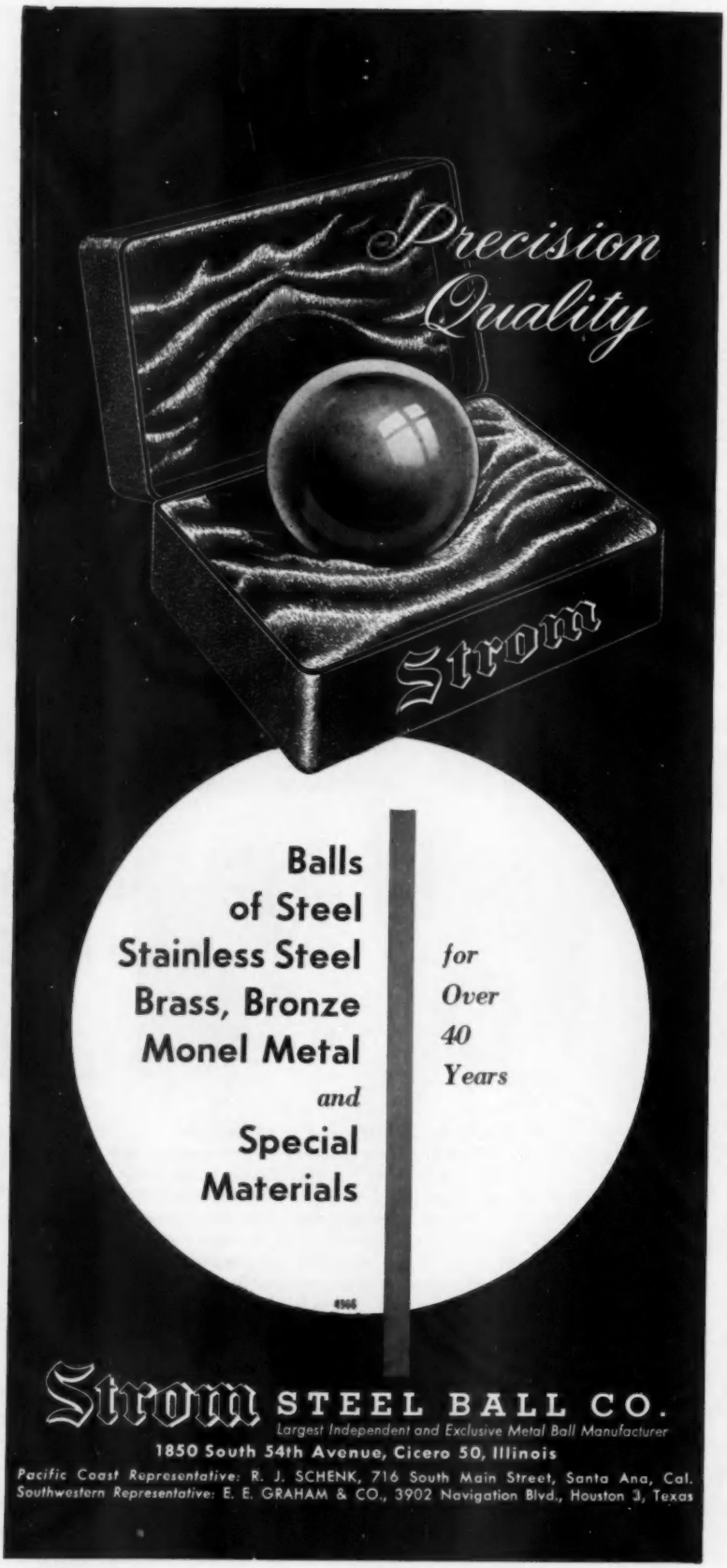
Harrison covers the "Hot and Cold" market with a complete line-up of automotive temperature controls!



Tailor-made temperatures are Harrison's stock in trade!
Harrison's all-around heat control means greater comfort and convenience with "out-in-front" air conditioning in summer . . . efficient heaters in winter! And Harrison radiators, thermostats and oil coolers assure peak engine and transmission performance. Leading car and truck manufacturers specify Harrison—with over 45 years' manufacturing experience and the most complete engineering research facilities in the automotive heat-transfer field. If you have a "hot" or "cold" problem, look to Harrison for the answer.

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.

HARRISON


Precision Quality
Strom
Balls of Steel
Stainless Steel
Brass, Bronze
Monel Metal
and
Special Materials
for Over 40 Years
Strom STEEL BALL CO.
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CALENDAR

OF COMING SHOWS AND MEETINGS

American Chemical Society, annual meeting, Atlantic City, N. J. Sept. 16-21

Instrument - Automation Conference and Exhibit, Coliseum, New York, N. Y. ..... Sept. 17-21

International Commercial Motor Transport Show, Earls Court, London, England .....Sept. 21-29

ASME Petroleum-Mechanical Engineering Conference, Conrad Hilton Hotel, Dallas Tex...Sept. 23-26

Trade Fair of the Atomic Industry, Navy Pier, Chicago, Ill.....Sept. 24-28

Atomic Industrial Conference Forum, Morrison Hotel, Chicago, Ill. .....Sept. 25-27

National Electronics Conference, Hotel Sherman, Chicago, Ill..Oct 1-3

AIEE Fall General Meeting, Morrison Hotel, Chicago, Ill.....Oct. 1-5

Standards Engineers Society, Hotel Willard, Washington, D. C...Oct. 3-5

Air Moving and Conditioning Association, annual meeting, Greenbrier, White Sulphur Springs, Va. .....Oct. 2-4

SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif.....Oct. 2-6

Paris Automobile Show, France..Oct. 4-14

ASME - ASLE Third Lubrication Conference, Chalfonte-Haddon Hall, Atlantic City, N. J....Oct. 8-10

National Metal Exposition, Public Auditorium, Cleveland, O. Oct. 8-12

Second Joint Military - Industry Packaging and Materials Handling Symposium, Wash., D. C. Oct. 9-12

Material Handling Institute, fall meeting, Traymore Hotel, Atlantic City, N. J.....Oct. 10-11

SAE National Transportation Meeting, Hotel New Yorker, New York, N. Y. .....Oct. 10-12

National Defense Transportation Association, conventiton and transportation forum, Salt Lake City, Utah .....Oct. 14-17

American Society of Body Engineers, annual convention, Rackham Bldg., Detroit, Mich...Oct. 17-19

International Motor Show, Earls Court, London, England ...Oct. 17-27

National Conference on Industrial Hydraulics, Sherman Hotel, Chicago, Ill. .....Oct. 18-19

SIPMHE Protective Packaging and Materials Handling Exposition, Kiel Auditorium, St. Louis, Mo. Oct. 21-24

National Industrial Exposition & Management Conferences, Artillery Armory, Detroit, Mich. Oct. 22-26

National Safety Congress and Exposition, Chicago, Ill. .....Oct. 22-26

ASME-AIME Joint Fuels Conference, Sheraton-Park Hotel, Washington, D. C. .....Oct. 24-25

Gray Iron Founders' Society, annual meeting, Homestead, Hot Springs, Va. .....Oct. 31-Nov. 2

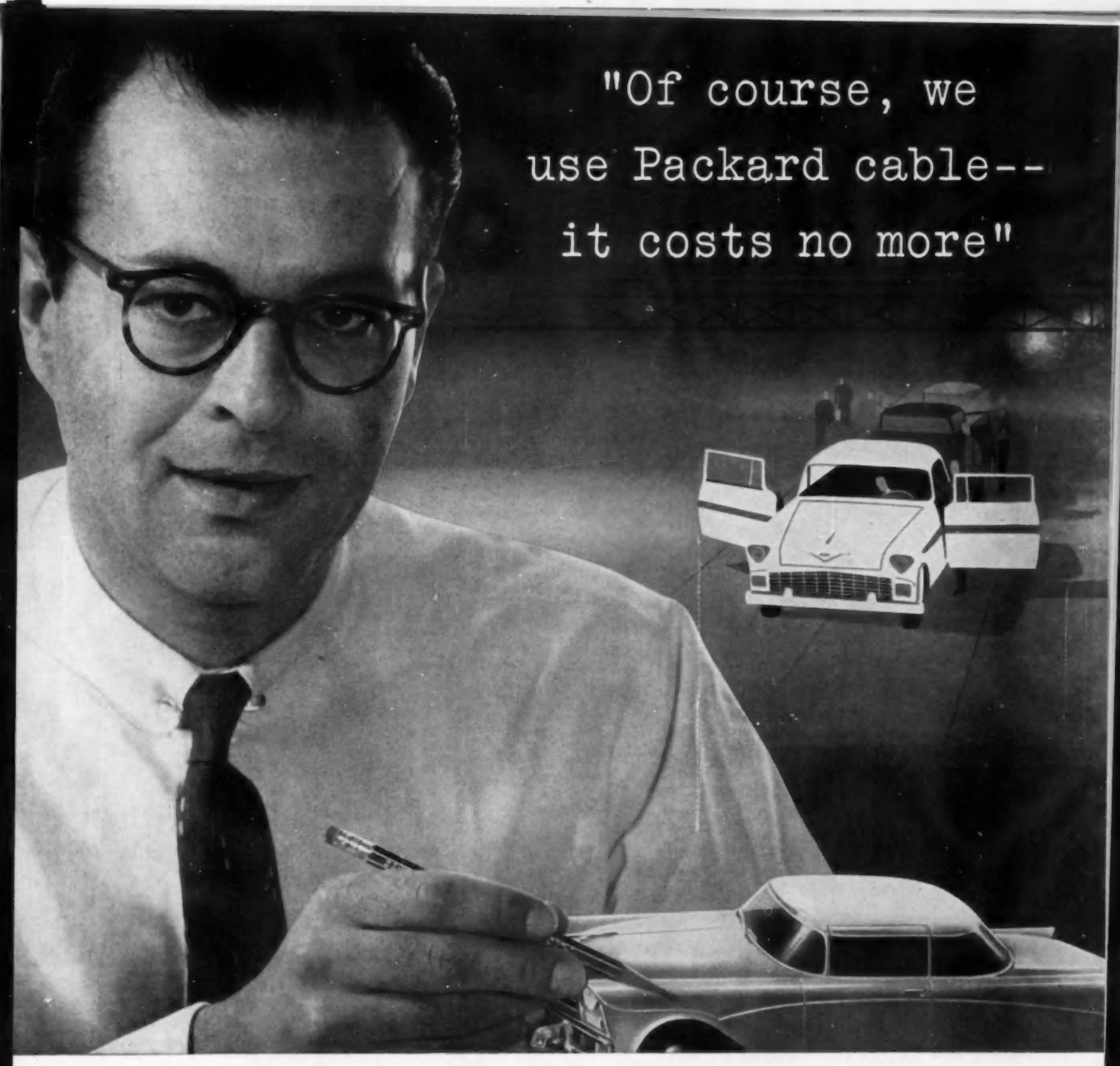
SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill. Nov. 1-2

National Tool & Die Manufacturers Association Convention, Statler Hotel, Hartford, Conn. .....Nov. 1-4

SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. .....Nov. 8-9

International Autorama Exposition, Commercial Museum, Phila., Pa. .....Nov. 10-17

National Automobile Show, Coliseum, New York, N. Y.....Dec. 8-16



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WHY TAKE CHANCES on cable troubles when it costs no more to specify the *best* in automotive cable and cable assemblies from Packard Electric. Here at Packard we have specialized for years in the development of tough insulation for all types of automotive cable—insulation so tough that it resists abrasion and chafing and cuts down the likelihood of electrical failure.

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GM GENERAL MOTORS

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A reliable source for dependable products

Perhaps no measurement of value is as important as dependability. For, obviously, in automotive components, sound design, outstanding performance, and efficient production service can only stem from an organization built on the solid foundation of dependability.

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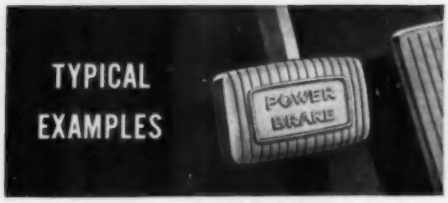

Bendix Power Brakes*

Bendix Power Steering*

Bendix Products Division

Bendix
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AUTOMOTIVE INDUSTRIES

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High Spots of This Issue

★ **Heavy-Duty Suspension Systems**

Steady improvements are being made in commercial vehicle suspension systems to enhance riding qualities and handling characteristics. Clark Equipment Co. has just come up with a new concept in versatile units. See Page 48.

★ **VW Transporters Produced in Europe's Newest Plant**

Operations have just gotten up a full head of steam at the highly modernistic new Volkswagen plant in Hannover, Germany. Now turning out 200 light commercial vehicles a day, it incorporates some interesting techniques. Page 50.

★ **Fuel Tank Output Increased by Production Alterations**

Higher production schedules have naturally resulted in a step-up in output of fuel tanks at the main plant of Oldsmobile at Lansing, Mich. This pictorial report shows how facilities were geared to meet the added demand. Page 56.

★ **New Gas Turbine for Industrial and Marine Use**

By agreement with the British concern of Ruston-Hornsby, Ltd., Clark Bros. Co. will make and sell the Ruston Mark TA gas turbine in the U. S. Described and illustrated here are its design and operating characteristics. Page 60.

★ **Numerous Records Are Set at 1956 National Aircraft Show**

Held this year in Oklahoma City over the Labor Day weekend, the National Aircraft Show drew an attendance of some 152,000 persons. Spectators saw many records fall in the trophy events and a wealth of aerial equipment. Page 64.

★ **36 New Product Items And Other High Spots, Such As:**

Differential and rear axle tube production; preview of 1957 British cars; huge dynamometer setup; Chinese truck output; world airplane records; hobbing machine; metal honeycomb freezing; aluminum in German cars; selected car equipment; new fork truck; cavitation pitting reduction; corrosion reduction; car air conditioner sales.

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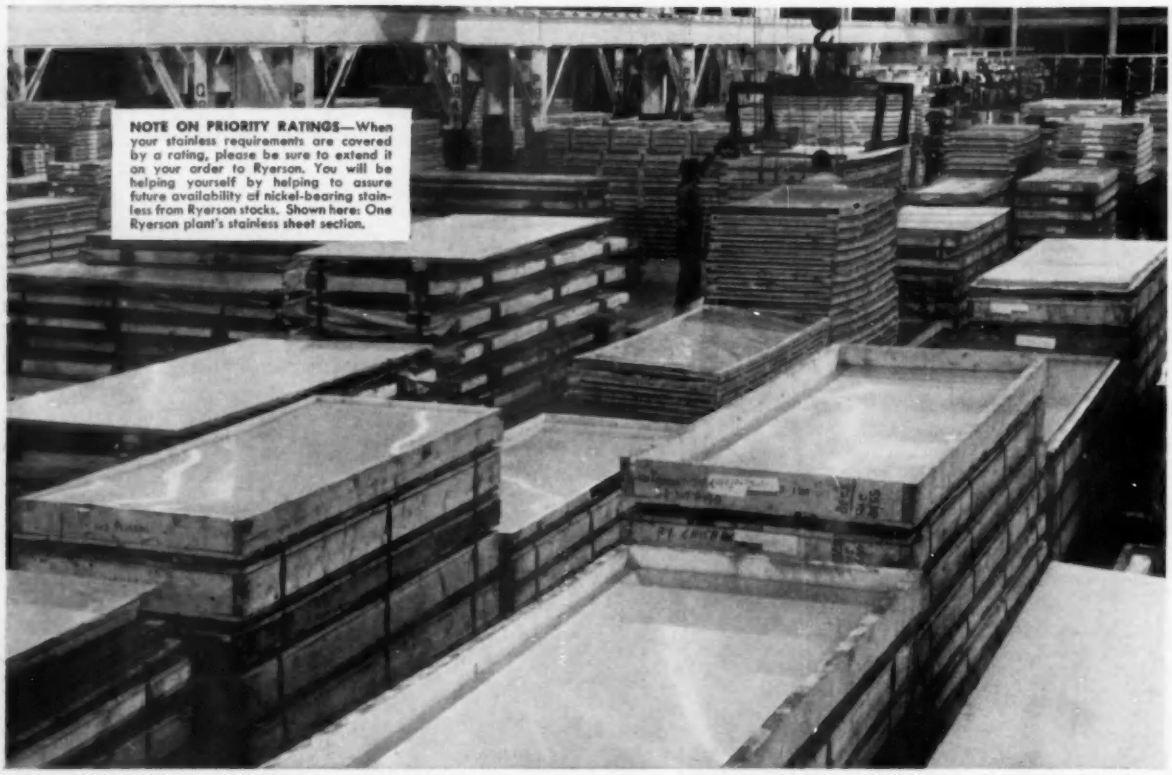
Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

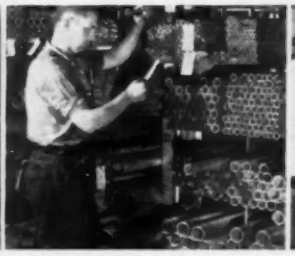


NOTE ON PRIORITY RATINGS—When your stainless requirements are covered by a rating, please be sure to extend it on your order to Ryerson. You will be helping yourself by helping to assure future availability of nickel-bearing stainless from Ryerson stocks. Shown here: One Ryerson plant's stainless sheet section.

for STAINLESS, call Ryerson...

Ryerson stainless bar stocks include free-cutting types, aircraft quality bars—many others.

Any shape can be accurately flame cut from stainless plate with special Ryerson plate burning equipment.



More than 300 miles of stainless pipe and tubing are on hand at Ryerson. Size range: ⅛" through 8⅝" O.D.

Felt pads on Ryerson shears protect the beautiful finish and flatness of Allegheny stainless sheets during cutting.

here's why:

your call to Ryerson connects you with the nation's largest stocks of stainless steel—2,351 sizes, shapes, types and finishes of time-tested Allegheny stainless—carried in tonnages that assure prompt shipment of your warehouse requirements.

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RYERSON STEEL

PRINCIPAL PRODUCTS: CARBON, ALLOY AND STAINLESS STEELS • MACHINERY & TOOLS • INDUSTRIAL PLASTICS, ETC.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 115, No. 6 September 15, 1956

Ford, Chrysler Aides Paint Rosy Picture of Car Output

Not many automobile company officials are willing to venture a guess about the exact number of cars the industry will produce and sell in 1957, but most are highly optimistic about the long-range view of the automobile business. Many of them believe that the next decade holds promise of great progress with a continuously expanding economy and notable technological advances.

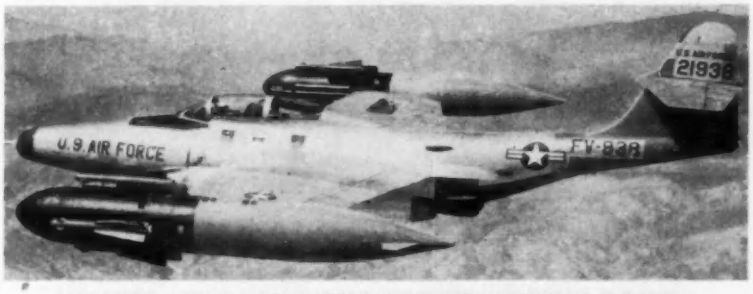
Latest observations about the future of the automobile industry come from Chas. R. Beacham, general sales manager of Ford Div., and Chas. L. Jacobson, Chrysler Corp. vice-president in charge of dealer relations.

Mr. Beacham believes the industry could sell as many as 9.5 million new cars a year. He does not indicate, however, whether that figure might apply to any one year prior to 1965. He predicts that there will be 10 million two-car families by 1965, and that total car registrations will rise to 66 million from the present 57 million.

Mr. Jacobson feels that it is not inconceivable that the industry may hit a 10-million-car year eventually, but not prior to 1965. Like Mr. Beacham, he is highly optimistic that the industry could build and sell eight million cars in a single year prior to 1965. Much of his optimism, however, is based on the possibility that the industry might come up with vastly advanced developments, such as a new type of engine, which could outmode current power plants.

Euclid Takes Options On 409 Acres In Ohio

Options on 409 acres of land have been taken at Hudson, O., by the Euclid Div. of General Motors. The company is planning eventually to set up a major operation in that area, including division offices.



DEADLY STING OF NORTHROP SCORPION EXPOSED

Revealed here are new details of the devastating wallop packed by the Northrop Scorpion F-89H. This photo shows for the first time how the Scorpion carries six Hughes Falcon guided missiles—three in each of its big wing tip pods. The plane also carries a total of 42 2.75 in. air-to-air rockets to provide a bristling arsenal.

Number of GM Shareholders Climbs To Record 639,509

General Motors reports that it had an all-time high of 639,509 stockholders on record during the third quarter. There were 612,512 owners of common shares and 26,997 owners of preferred stock recorded on August 16.

The total number of holders of common shares compares with 459,099 in the fourth quarter of 1954.

S-P Will Continue Packard in 1957

Announcement by Studebaker-Packard that a 1957 model Packard will be introduced in January still leaves many questions unanswered. Dealers were notified that the Packard-Clipper 1957 model will go into production in December, but nothing was said about the higher priced Packard.

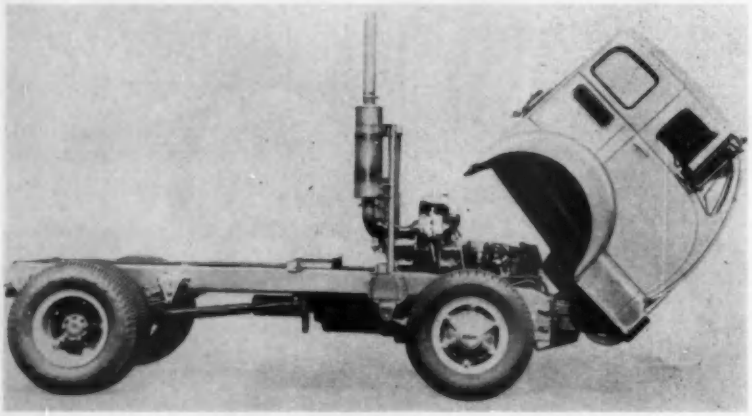
Although the car will be produced in South Bend, no indication was given as to whether it will use the Packard V-8 engine and Ultramatic transmission or Studebaker components. Likewise, no source of body stampings was indicated, again leaving open the question of whether the body and other sheet metal will be off Studebaker dies or off tooling moved from Detroit.

Meanwhile, in Detroit, a dissident S-P stockholder is opposing the recent management agreement with Curtiss-Wright under which the latter could buy up to five million shares of S-P stock at $5 per share. Sol A. Dann, holder of 300 shares, has submitted resolutions to the company calling for dissolution of the corporation, a Federal Court investigation of the company's affairs going back to 1951, an auditors' investigation for shareholders, and a requirement that all present and former owners swear under oath as to whether or not they have ever sold company stock short.

The petitioner has requested that the resolutions be included in proxy material soon to be sent to shareholders, prior to a special meeting called to act on the Curtiss-Wright proposal. He also has filed a copy with SEC in Washington.

Dann stated that stockholders should not be required to undergo further risk of their investments in a new venture with Curtiss-Wright, and that, on the basis of latest financial reports, they should realize about $15 a share from dissolution.

News of the AUTOMOTIVE



WHITE TURBODIESEL OFFERS PAYLOAD ASSETS

White Motor Co. has introduced a new cab-forward highway tractor—the White 3000 Turbodiesel—to round out its line of highway tractors. The new unit has a cab four in. higher than previous 3000 models and is powered by a 175-hp Cummins JT6B-15 Diesel engine. The White 3000TD is available with regular power-lift cab as well as the 3000 sleeper cab and also with a steering pusher axle for additional payload benefit under some operating conditions. Power steering is available as an option.

'Portable' Car Air Cooler Being Readied For Market

One of the Big Three car companies soon will announce an air conditioning unit which can be transferred from car to car. It can be installed at the factory or by the dealer and is entirely front-mounted.

When an owner sells his car, he can have the air conditioner transferred to his new one, provided it is the same company make. Installation time is about five hours.

AC Spark Plug Reports On Expansion Program

AC Spark Plug's multi-million dollar improvement and expansion program, which includes several projects recently completed and others now under way, will increase production capacity markedly and provide more efficiency in manufacturing operations. Much of the expansion is within the confines of existing buildings, where new manufacturing innovations are being installed for production of parts for 1957 automobiles.

Some of these which are now in operation include: a new materials handling system which conveys parts from presses through washers and into the assembly area; new facilities for fuel pump machining and assembly which permit six special machines to operate as a single unit; and a continuous operation for processing decorative die castings from the casting stage through buffing, plating and painting.

Other projects which are either under construction or near completion include a 225,000 sq ft manufacturing building and a 28,000 sq ft assembly area. Instrument panels for all GM cars and trucks, as well as heavy duty instruments, will be assembled there.

Planned for the future is a new engineering test building. The L-shaped structure will house a dynamometer section; an area for fuel pump testing; and a bay for oil filter testing.

Kaiser Sales and Earnings Indicate Good Upward Trend

Net earnings of Kaiser Aluminum & Chemical Corp. were $43,293,295 for the fiscal year ended May 31, 1956. This included $2,655,152 nonrecurring income.

Net sales were $330,712,209, a 23 per cent increase over the previous year's $268,133,162. New records were established in production, sales, and earnings.

S-P Reports $35.4 Million Loss On Sales Totaling $181 Million

Studebaker-Packard Corp. reported a loss of $35.4 million for the six months ended June 30, more than four times greater than in the comparable period in 1955, when its loss totaled $8.5 million. The 1956 loss was before special charges totaling $28 million. It was not quite clear what the "special" charges represented, but it is understood that a portion included provisions for inventory obsolescence.

Net sales for the period dropped to $181.6 million from $288.5 million during the first six months last year. The company suffered its heaviest loss in the second quarter of this year—$21.1 million, also before special charges. This compared with a loss of $3.9 million in the second quarter of 1955.

Significent in the S-P financial picture is the announcement by H. E. Churchill, new president of the corporation, that the maturity date on S-P's bank notes has been extended to three years from the "current" basis, concurrent with the management-lease agreement with Curtiss-Wright Corp. S-P's notes, payable to a group of banks headed by Chase Manhattan Bank, aggregated $29.7 million.

Oliver Corp. and J. I. Case Suspend Merger Discussions

Negotiations on the possible merger of Oliver Corp., and J. I. Case Co., have been discontinued, at least for the present. No specific reasons were given for dropping the merger talks.

Both concerns have been operating in the "red" for some time as a result of declining farm equipment sales. It was thought earlier that such a merger would have been beneficial.

Oliver may have some other plans, but they are not known at present. The company currently is reviewing its pricing policy to determine how much it may raise prices before the end of the year. It already has announced an eight per cent boost on repair parts for farm machinery.

Just at presstime, it was announced that Case directors approved a plan for merger with American Tractor Corp.

AND AVIATION INDUSTRIES

Ford Elected to Membership In AMA to Formalize Status

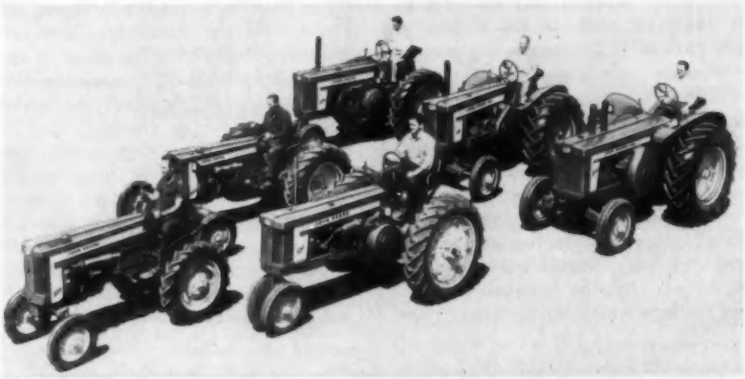
The Automobile Manufacturers Association has elected Ford Motor Co. to membership in the organization by unanimous vote. The invitation to join AMA has been a long-standing one. For many years, although Ford was not a member, it cooperated with AMA and contributed generously both in finances and manpower to further industry projects.

Even before actual election, Ford had agreed to participate in plans for the forthcoming National Automobile Show. In remarking that the company for some time has enjoyed a pleasant association with AMA, has supported, and participated in many worthy programs, Henry Ford II, president of Ford Motor Co., said, "It would not seem to serve the best interests of the industry, the association, or Ford Motor Co. to continue our relationship on an informal basis."

Henry Ford II, Ernest R. Breech, Ford Motor Co. chairman, and Harold E. Churchill, new president of Studebaker-Packard Corp., were elected to the AMA board of directors. George Romney, president of American Motors Corp., was named president of the association to succeed James J. Nance, former head of Studebaker-Packard Corp. L. L. Colbert, president of Chrysler Corp., was made AMA vice-president for passenger car sales; and J. N. Bauman, president of White Motor Co., was elected treasurer. Other AMA officers are: Harlow H. Curtice, president of General Motors Corp., secretary; and E. J. Bush, vice-chairman and treasurer of Diamond T Motor Car Co., vice-president for motor trucks.

Standard Products, Sheller Call Off Plans For Merger

While industrial mergers continue almost unabated, it is interesting to note that some companies are taking a more cautious attitude toward such moves. At least four companies within the past several weeks have decided against merging after looking at the positive and negative sides of such a move more carefully.



DEERE TRACTOR LINE PRODUCES MORE WITH EASE

Increased power for greater daily work output and more versatile hydraulic systems for greater ease of operation are among the major advancements claimed for the new John Deere tractor family. The line includes six power sizes and 30 basic models. The complete range of power sizes and models is engineered to meet specific farming needs in every part of the country. An extensive range of options are provided.

Latest two companies to abandon plans for a merger are Standard Products Co., Cleveland manufacturer of automobile door locks, window channels and weatherstripping, and Sheller Manufacturing Corp., of Detroit and Indiana, maker of steering wheels and parts. Neither of the companies gave details as to why the proposed merger was dropped.

Industry Optimistic On 1957 Car Sales

All indications point to a better automobile market next year than the market in 1956.

Balancing out the favorable omens against those that might curtail the market, the plus factors appear to be in the majority.

New fresh styling for a large majority of the 1957 models may again set off a buying splurge similar to the one experienced in late 1954 when the 1955 models hit the market. Not only will appearance be markedly improved, but many new performance and comfort features will be provided.

The market itself will be in much healthier shape than it was at the outset of the 1956 model run. Certainly there will be no clean-up problem hanging over the industry this year. From all evidence, the manufacturers intend to exercise a much closer balance between production and field stocks.

Another difference between 1956 and 1957 is that there will be practically no residual effects of borrowed business, since manufacturers have not forced the market as they did last year. A large segment of the buying public will have paid off its obligations on the 1955 models and will again be in position to take on purchase of a new car.

Offsetting these favorable factors will be undoubtedly higher prices resulting from increased labor and material costs. There has been no evidence yet as to the extent of the higher markups, but the general opinion is that they will not be as great as some published estimates. General thinking is that price increases may run from 2 to 5 per cent. Certainly, with competition as rugged as it is and with the public showing as much price resistance as it has during the past year, manufacturers will hold the increases to the absolute minimum.

Another uncertain factor in the 1957 market stems from the new discount rate of 3 per cent fixed by the Federal Reserve Board on money which member banks borrow from the system. The rate increase, the

News of the AUTOMOTIVE

sixth in 16 months, may be reflected in financing rates to the buyers of new cars on installment contracts.

Finance companies generally are planning to increase their charges to dealers, although there has been no concerted move in that direction yet. This can be accomplished by increasing the rate for floor plan money, by reducing the dealer's finance reserve, or by increasing the discount rate on finance paper purchased. Actually, the banks and finance companies do not set the rate which the consumer pays, since that is a matter between the dealer and the customer. However, as the cost of financing rises to the dealer he can either increase the rate to the customer or cover the added cost indirectly by allowing less for a trade-in or by marking up the price of the vehicle. These may be the only ways to recover added costs in states where consumer loan rates are fixed by law. Just how much of the added financing will be passed on and how it will affect next year's market is a matter of conjecture.

1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	For Weeks Ending				Total Jan. 1 to Sept. 1, 1956
	Sept. 1	Aug. 25	Aug. 18	Aug. 11	
PASSENGER CAR PRODUCTION					
Hudson	10	87	0	0	19,754
Nash	69	214	0	12	47,969
Rambler	540	*	*	*	540*
Total—American Motors	619	301	0	12	68,263
Chrysler and Imperial	0	67	85	2,837	79,236
De Soto	649	1,756	1,924	1,888	71,190
Dodge	0	0	1,686	4,479	136,455
Plymouth	0	5,242	9,596	9,705	313,408
Total—Chrysler Corp.	649	7,065	13,291	18,909	600,289
Ford	0	0	22,447	26,852	884,094
Lincoln and Continental	403	209	9	12	33,729
Mercury	3,722	4,473	4,721	4,647	184,274
Total—Ford Motor Co.	4,125	4,682	27,177	31,511	1,102,097
Buick	7,989	9,963	9,608	10,039	402,316
Cadillac	1,918	3,206	3,080	3,211	109,460
Chevrolet	31,335	30,802	30,690	29,520	1,136,747
Oldsmobile	8,490	8,070	7,723	8,086	316,564
Pontiac	5,124	6,061	5,714	5,747	236,901
Total—General Motors Corp.	52,856	58,101	56,815	56,582	2,205,972
Packard	0	0	0	0	13,299
Studebaker	0	72	991	1,255	54,154
Total—Studebaker-Packard Corp.	0	72	991	1,255	67,443
Checker Cab	84	53	78	78	2,443
Total—Passenger Cars	58,333	70,304	98,352	108,348	4,046,507
TRUCK PRODUCTION					
Available	7	9	10	9	264
Chevrolet	6,501	6,448	7,386	6,536	252,872
G.M.C.	1,385	1,672	1,546	1,520	64,687
Diamond T	99	109	101	110	3,486
Divco	56	60	60	60	2,629
Dodge and Fargo	2,011	1,802	2,090	1,379	62,400
Ford	3,448	3,256	5,704	6,314	208,296
International	2,522	2,402	2,199	2,273	93,614
Mack	397	374	289	318	12,587
Marmon-Herrington	26	30	30	30	498
Reo	71	72	90	91	2,641
Studebaker	288	524	411	406	11,402
White	344	358	365	347	12,274
Willys	1,452	1,399	1,260	0	39,842
Other Trucks	116	132	112	127	5,038
Total—Trucks	18,725	18,647	21,673	19,511	772,613
Buses	54	72	79	82	2,975
Total—Motor Vehicles	77,112	89,023	120,104	127,941	4,822,095

*—Prior to week ending Sept. 1, 1956, Rambler production was included with Nash and Hudson.

Palletization Of Car Parts Proves Successful At Buick

Palletization of incoming parts orders has been so successful at Buick that now nearly all assembly line components are handled by the system. Buick, which gives much credit to its suppliers for helping develop the packaging system for its plant, today receives about 95 per cent of its incoming orders in palletized form.

The company has found that palletization not only provides space savings, but that it reduces handling costs, makes possible faster and easier movement of parts to assembly lines, and increases safety and all-around efficiency.

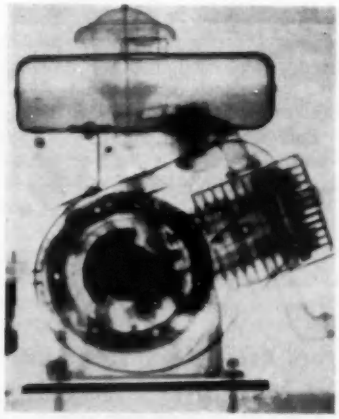
Citing a few examples of the advantages of palletization, Buick says that it now can receive 156 steering wheels in four open-faced boxes with a single lid. It used to receive 10 in one cardboard box with a stapled cover.

Radios now come 80 to a carton, whereas before they were shipped two to a box, which frequently resulted in damage because the boxes were small enough to be tossed around by workers. Parts suppliers using the system also have realized substantial savings.

Divco Plans To Acquire Wayne Works Of Indiana

Acquisition of Wayne Works, Inc., Richmond, Ind., manufacturer of school buses, by Divco Corp., Detroit, is expected to add approximately $15 million to the latter company's annual sales. Still subject to approval by stockholders, the acquisition also will provide other additional benefits to the Detroit company, which has been undergoing an expansion program and diversifying its products.

The Indiana concern operates two subsidiaries which Divco also will acquire under the agreement. They include the Meteor Motor Car Div. of Piqua, Ohio, and A. J. Miller Div. at Bellefontaine, O., which make bodies for ambulances and funeral cars. The Indiana company will retain its name, and no changes planned in personnel at present.



FIRST ENGINE X-RAY

The inner secrets of a running engine have been exposed in this pioneer X-ray picture. It is the result of a new stroboradiographic technique developed by the General Electric Co. in cooperation with the Detroit Arsenal. Using radiation pulses and special equipment, engineers now can get slow-motion and stop-motion photos through the engine block and cylinder walls of a running engine. The X-ray above was taken of a two-hp, four-cycle gasoline engine.

Radioactive Isotope Usage Shows Big Industrial Gain

The number of industrial users of radioactive isotopes has increased more than 500 per cent within the past five years, according to a survey by the Atomic Industrial Forum. More than 1000 industrial organizations in the U. S. are now using atomic energy by-product materials in 1347 different installations.

Radioactive materials supplied by the U. S. Atomic Energy Commission are being used for gaging and control operations in the manufacture of a wide variety of consumer products by more than 400 organizations. These include roofing and flooring materials, paper, steel, textiles, rubber, plastics, glass, and cigarettes.

Some 350 firms are using nuclear by-product materials in radiation inspection of welds and castings and in other metalworking operations. According to estimates of the AEC, these and other radioisotope applications now mean an annual savings to industry of $200 million per year.

AI TABLOID

Fairchild Engine & Airplane Corp. has placed its new M-185 jet-powered executive aircraft on the market.

* * *

Caterpillar Tractor Co. has acquired Englehart Mfg. Co. The latter will be operated as a wholly owned Caterpillar subsidiary.

* * *

Youngstown Sheet and Tube Co. will build a new general office building.

* * *

Chevrolet will shortly undertake a $1 million expansion program at its foundry in Tonawanda, N. Y. . . . Cessna Aircraft Co. plans a $10 million major expansion program.

* * *

Ford Motor Co. may join Reynolds Metals Co. in establishing a car parts aluminum fabricating plant northeast of Massena, N. Y.

* * *

Stackpole Carbon Co. celebrated its 50th anniversary on August 8.

* * *

U. S. Steel Corp. has developed a new plastic-coated steel sheet. . . . Alco Products, Inc., has developed a new leaded steel for easier machining.

* * *

Minneapolis - Honeywell Regulator Co. will build a new $4 million aeronautical plant near St. Petersburg, Fla.

* * *

Cockshutt Farm Equipment, Inc., has introduced an all-weather farm tractor that is air conditioned for summer and heated for winter.

* * *

Aeroquip Corp. has acquired General Logistics Corp. . . . Grumman Aircraft Engineering Corp. has acquired a half interest in Dynamic Developments, Inc.

Du Pont Co. will build a $2 million radiation physics laboratory at Wilmington, Del.

* * *

General Electric Co. has changed the name of its Trumbull Components Dept. to Circuit Protective Devices Dept. and that of its Aircraft Gas Turbine Development Dept. to Flight Propulsion Laboratory Dept.

* * *

Hupp International has been formed as a division of Hupp Corp.

* * *

Shallway Corp. and Shalco Engineering Corp. have consolidated. . . . McKay Machine Co. and Metal Processing Machine Co. have merged.

* * *

Russia is alleged to have built a collapsible midget helicopter.

* * *

Armour Research Foundation of Illinois Institute of Technology has developed a novel method of coating metals and other substances with ceramic materials.

* * *

Republic Steel Corp. plans a new $4.5 million electrolytic zinc plating line at its Cleveland, O., plant.

* * *

Borg-Warner Corp. has developed a gasoline fuel injection system for internal combustion engines. Model of the injector was exhibited at the SAE Tractor Meeting in Milwaukee, Sept. 10-13, by the company's Marvel-Schebler Products Div.

* * *

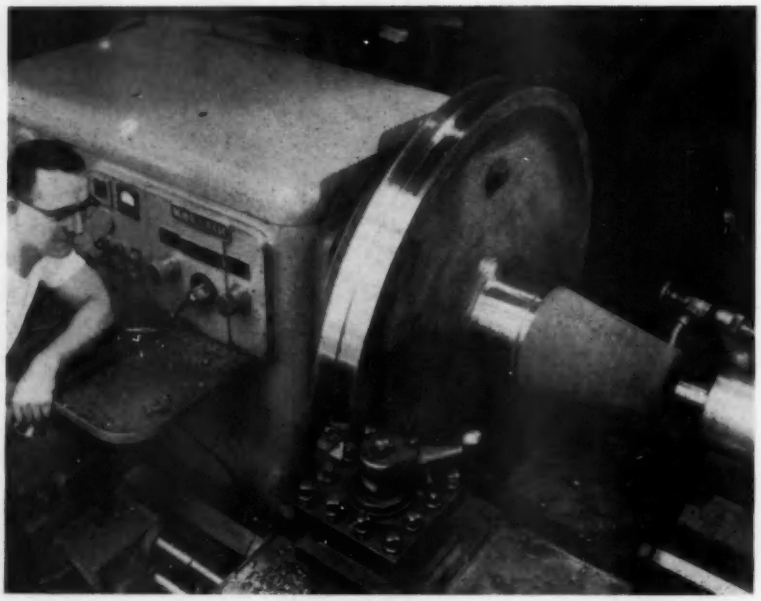
A.C.V. Sales, Ltd., of England, has introduced a new 72-passenger bus called the Bridgemaster.

* * *

Autocar Div. of White Motor Co. is now offering new lightweight models for additional payload advantages.

(Turn to page 130, please)

News of the AUTOMOTIVE



GIGANTIC WORKPIECE READILY HANDLED ON LATHE

This 44-in. diam steel forging—a huge crank gear blank for a tire vulcanizing press—is one of a series currently being precision machined in the plant of McNeil Machine and Engineering Co. Complete rough and finish turning are being done on a new Monarch Series 90 heavy-duty Dynashaft lathe with 48-in. swing. The small diameter is also rolled for smoothness and hardness on this machine. Using both carbide and high-speed steel cutting tools, accuracy is carefully held within .001 in.

Car Manufacturers Consider Governors for Speed Control

Governors to control maximum car speed without affecting performance during acceleration are under study by automobile makers. One type would be geared to the drive shaft or transmission output shaft, rather than to the engine. It would not permit the engine to turn up any more rpm after the preset maximum road speed is reached as indicated by drive line rpm.

New Car Inventories Slashed To 500,000 Units Last Month

New car inventories continue to drop appreciably as the industry gets ready to enter its 1957 model season. An upturn in sales in the past two months—resulting partially from promotional efforts of dealers—plus a very sharp decline in production, reduced inventories (for the fourth straight month) to approximately 500,000 units, about 25 per cent below the same month last year.

Sales last month (August) moved slightly ahead of the July total, climbing to an estimated 480,000 units. This was only about 15 per cent under the 564,272 units sold in April, the best month so far this year. Production last month was in the neighborhood of 400,000 units, which markedly helped to balance inventories. It was the lowest monthly production total so far this year and a substantial decline under the July total. This is not surprising in view of the fact that some car makers shut down production lines completely in August to prepare for new model production.

No appreciable change in the production picture is expected this month. While most of the Chrysler and Ford Divisions will be back in full production on their 1957 models by the middle of this month, General Motors Divisions will just be going into their changeover periods. Total car production for the year topped the four million mark last month and should stand at about 4.35 million at the end of September. The industry is now expecting to turn out about 1.7 million cars in the final quarter, bringing the year's production to approximately 6 million units. These projections may prove conservative when the new models make their appearance in dealer showrooms soon.

Ford Reports It Lost $800,000 On Safety Belts In First Year

A report by Ford that it had lost $800,000 in introducing safety belts is not surprising in view of the fact that the company has been pricing the belts at below cost. When the company first introduced the belts, it indicated that it would sell them at no profit to illustrate the importance it placed on them as a contributory facter to highway safety. It has equipped approximately 45 per cent of its 1956 models with the safety belts, padded instrument panel and padded visors.

The company did not indicate whether it plans to continue selling safety belts at below cost on 1957 models. Some observers feel that Ford has told its safety story in the past year's promotional efforts, found the money well spent, and now may revise its pricing structure on safety belts.

Automatic Transmission Output At Chrysler Passes Two Million

Chrysler Corp. last month (August) built its two millionth automatic transmission, approximately 3½ years after the first unit was put into production in February, 1953. The second million units were built in only 14 months, or half the time it took to turn out the first million.

Chrysler Corp. currently is equipping more than 87 per cent of its cars with PowerFlite transmissions, compared with 80.8 per cent last year. Plymouth has made the largest percentage gain of all Chrysler car divisions in automatic transmission installations during the past year, in climbing from 43.7 per cent to 62.3.

AND AVIATION INDUSTRIES

Studebaker-Packard Launches Bold Program for '57 Market

Guided by a practical philosophy based on "realism and common sense," Studebaker-Packard Corp. has launched a program that is designed to restore it to a profitable operating position by the end of 1957. Harold E. Churchill, new president of the corporation, stated at a press preview of Studebaker cars and trucks for 1957 that a three-pronged campaign will be followed along the "comeback trail": a rigid cost reduction program; a market development plan to support the present dealer organization; and a product development program that stresses price areas where the company's products have their greatest strength.

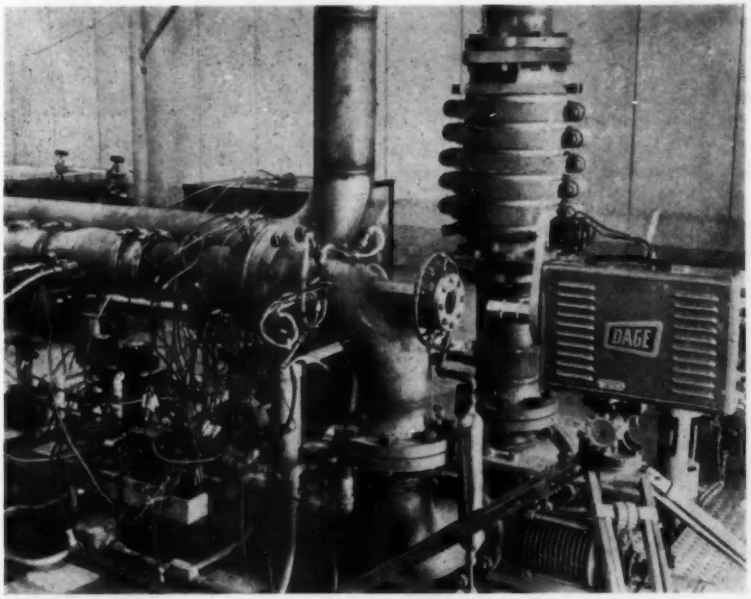
Discussing the company's marketing target, Mr. Churchill said that for 1957 the corporation has set a sales target for Studebaker cars and trucks, including export and Canadian sales, of 150,000 units. He went on to declare that Studebaker domestic car sales should account for 103,000 units of the aforementioned total, or approximately 1.58 per cent of an estimated industry total of 6.5 million domestic passenger car sales.

The cost reduction program, in addition to consolidating manufacturing activities at South Bend, Ind., comprises such other elements as rearrangement and modernization of existing facilities, more integration of parts production, and streamlining of the sales organization.

Insofar as the market development phase of the program is concerned, efforts will continue to have all possible dealers handle both the Packard and the Studebaker franchises. At the same time, aggressive new model advertising campaigns will be initiated.

While Mr. Churchill admitted that diversification plans were under consideration, he drove home the point that Studebaker-Packard must stand on its own feet and make a profit in the automotive field. The intention is to place prime reliance on the Studebaker line in the attainment of this goal, so that the Packard program will be considered for practical purposes as actually "plus income."

Studebaker sales this year are expected to total 95,000 units. New season starts about Nov. 1.



CLOSED CIRCUIT TELEVISION VALUED BY FORD

Closed circuit television is used at the Pilot Gas Turbine Laboratory of Ford Motor Co. in Dearborn, Mich., to provide remote observation of engine performance characteristics in hazardous areas. Television camera above, made by Dage Television Div. of Thompson Products, Inc., is set up in combustion test cell. It transmits the flame pattern in the combustion chamber for an experimental gas turbine engine to a television monitor located in a nearby control room for ease of observation.

Fruehauf Takes Strong Stand Against FTC Monopoly Charge

Fruehauf Trailer Co., through a statement by President Roy Fruehauf, has indicated the course of its defense against a Federal Trade Commission charge of violating the anti-merger law by acquiring five companies over the past nine years.

Mr. Fruehauf said acquisition of the companies "does not constitute a design to throttle competition." He added that demand for highway freight equipment has been growing because of the expanding highway transportation industry. It has thus been necessary for Fruehauf to "move ahead to satisfy this demand. There is ever room for others."

Principal charges made by FTC are that acquisition of five "competitor" concerns has lessened competition and that potential monopoly power stems from the company's subsidiary, Fruehauf Trailer Finance Co. FTC claims that the latter offers special financing deals competitors cannot provide.

The Fruehauf statement said the company has supported and conformed with all laws that apply to its business and that its formal answer to the complaint will demonstrate that the allegations are without foundation. FTC has set Oct. 30 as the hearing date in Detroit.

Touching on the financing subsidiary charge, Fruehauf said that customers are free at all times to pay cash or arrange financing through other agencies. He added that the subsidiary was necessary to provide capital for many small businesses.

Continued on Page 94

Men in the News

Muskegon Piston Ring Co.—Allan E. Swartz has been promoted to chief product engineer.

New Departure Div., General Motors Corp.—**Kenneth V. Knebel** is now general manufacturing manager.

AC Spark Plug Div., General Motors Corp. — **Lloyd M. Steward** has been appointed director of quality control.

Chrysler Corp. — **Charles Harmon** was chosen manager of the Detroit Tank Plant.

Republic Aviation Corp., Guided Missiles Div.—**Robert W. Boesel** was named chief project engineer.

Mack Trucks, Inc. — **Harvey W. Bush** has been named assistant manager of operations.

Ford Motor Co.—**Lowell E. Krieg** is now styling operations manager in the Styling Office.

Eclipse-Pioneer Div., Bendix Aviation Corp.—**Haydn R. Jones** has been appointed comptroller.

Westinghouse Air Brake Co.—**A. King McCord** has been elected president.

Seneca Falls Machine Co.—**R. M. Wheeler** has been made executive assistant.

Electric Storage Battery Co.—**Cody M. Murray** has been made manager of industrial relations.

Motch & Merryweather Machinery Co., Machinery Manufacturing Div.—**R. F. Myers** has been made sales manager.

Pratt & Whitney Co., Inc., Gage Div.—**James B. Wilkie** has been appointed manager.

Reynolds Metals Co.—**Martin F. Finnerty** has been named assistant industrial advertising manager.

Onio Crankshaft—**Paul T. Koenig** has been named secretary and treasurer.

Goodyear Tire & Rubber Co.—**John C. Virden** has been elected a director.

Ohio Crankshaft Co.—Foster H. Pettay has been elected president, and M. J. Hoke has been appointed senior vice-president and general manager.

Consolidated Vacuum Div., Consolidated Electrodynamics Corp.—**Norman A. Flannigan** was made manager of advertising and public relations.

Flight Refueling, Inc.—**William F. Whitesides** was named engineering manager, and **C. Harry Smith** was made chief engineer.

Ford Motor Co.—**Victor J. Michaels** is now purchasing agent for the styling office.

Sahlin Engineering Co., Inc.—John H. Ryckman has been elected secretary and treasurer.

Continental Aviation and Engineering Corp.—**H. A. Todd** and **Robert P. Brooks, Jr.**, were elected to the board of directors.

American Motors Corp., Special Products Div.—**Milton Saks** has been named assistant director of industrial relations.

Cleveland Graphite Bronze Co.—**William R. Mogg** is now special products sales manager.

Northrop Aircraft, Inc. — **Irving Roth** was elected assistant to the president, and **J. Grant Macdonnell** was named assistant treasurer.

Kropp Forge Co.—**Waldemar Naujoks** has become manager of engineering.

AC Spark Plug Div., General Motors Corp.—**Willis J. Oldfield** has become public relations manager for the Milwaukee plants.

Studebaker - Packard Corp.—Carl K. Revelle has been appointed general sales manager.

Motor Products Corp.—**Lynn A. Fill** has retired as chief engineer.

TelAutograph Corp.—**John O. McReynolds** is now manufacturing manager.

Warner Electric Brake & Clutch Co. — **Alonzo A. Neese** has been elected to the board of directors.

Chrysler Corp., Parts and Equipment Manufacturing Div.—**Harold E. Musselman** has been named comptroller.

Farrel-Birmingham Co., Consolidated Machine Tool Div.—**Edward S. Coe, Jr.**, has been appointed general manager.

Insuline Corp. of America—**Samuel J. Spector** has been elected chairman of the board, and **Myles S. Spector** has been elected president.

American Motors Corp. — **John Adamson** has been promoted to staff assistant.

American Forging & Socket Co.—**William H. Graves** has been named to the board of directors.

International Harvester Co., Motor Truck Div.—**Hugo Weissbrodt** has retired as special assistant on the staff of the manager of manufacturing. He was formerly works manager at the Fort Wayne Works.

Adamas Carbide Corp.—**Leo J. Rickes, Jr.**, was made advertising and sales promotion manager.

Cargill Detroit Corp.—**Richard O. Straight** has become manufacturing manager; **William H. Ducker**, sales manager; and **William M. Peterson**, assistant manufacturing manager.

Russell Manufacturing Co.—**Robert B. Williams** was chosen administrator and assistant to the president.

Gar Wood Industries, Inc.—**David J. Davis** is now general sales manager for construction machinery.

Goodyear Tire & Rubber Co. of Calif. —R. W. Maney was appointed vice-president and general manager.

Seneca Falls Machine Co.—V. L. Percy has been appointed chief engineer, and T. E. Rodgers has been named works manager.

Pratt & Whitney Co., Inc., Cutting Tool and Gage Divs.—Edward J. Shages has been named vice-president and manager.

Hyster Co., Industrial Truck Div.—**Jack A. Cairns** has been promoted to supervisor of advertising and promotion.

Joseph T. Ryerson & Son, Inc.—**Joseph D. Gavin** is now manager of the Sheet and Strip Order Dept.

Pittsburgh Plate Glass Co., Fiber Glass Div.—**Peter J. Baier, Jr.**, was chosen manager of transportation sales, and **Charles E. Barby** was named manager of automotive sales.

Vickers, Inc.—**E. L. Burkhart** has been named personnel director.

Wagner Electric Corp.—**Russell E. Bryant** is now manager of the electrical division of the Los Angeles branch.

Allison Div., General Motors Corp. —**Brooks Honeycutt** was named assistant director of public relations.

Lansdale Tube Co.—**Cyrus H. Warshaw** was chosen general sales manager.

Efficient Engineering Co., Inc.—**Joseph A. Brust** was made chief engineer.

Hoover Ball & Bearing Co., Ball and Bearing Div.—**James A. Carman** is now director of materials and purchasing.

General Electric Co.—**Russell R. Menard** has been named manager of marketing administration in the Plastics Dept., and **Boyd W. Bullock** has been made manager of marketing for the Laminated and Insulating Products Dept.

Osborn Manufacturing Co., Brush Div.,—**R. O. Peterson** has been elected vice-president of engineering.

Wooster Rubber Co. — **James K. Buckwalter** has been made vice-president in charge of sales, and **Donald E. Noble** has become vice-president in charge of finance.

Republic Aviation Corp.—**Lou Helmuth** has been made assistant sales manager in charge of administration, and **Murray Berkow** has been chosen assistant sales manager in charge of weapons systems.

Temco Aircraft Corp.—**Jack J. Gray** has been named superintendent of manufacturing services.

Bell Aircraft Corp. — **Robert R. Payne** has been appointed advertising manager.

Massey - Harris - Ferguson, Inc. — **Marshall E. Monroe, Jr.**, was made a vice-president.

Morton Manufacturing Co.—**Henry W. Kreifeldt** has been made sales manager.

Wright Tool & Forge Co.—**Ray W. Hermanson** has become sales manager.

Vickers, Inc.—**William B. Main** is now aircraft service manager for the Western region.

Kaiser Aluminum & Chemical Corp. — **Alan DeRoss** has been appointed technical specialist in the pig and ingot product office of Kaiser Aluminum & Chemical Sales, Inc.

Electric Auto-Lite Co.—**Lewell G. Strausbaugh** has been named supervisor of the Time Study Dept., and **Charles A. Gogel** has been appointed assistant supervisor.

Circo Equipment Co.—**Stanford J. Barlett** has been appointed manager of the Washer Div., and **Walter J. Reinecker** is now chief engineer of the Sonic Div.

Joy Manufacturing Co. — **William Hanson, Jr.** is now manager of conveyor products at the New Philadelphia plant.

Vickers, Inc.—**Robert Thoren** is now district manager for the Rockford, Ill., area.

Controls Corp. of America—**Louis Putze** has been made president, and **Roy W. Johnson** has been made chairman of the board.

Soreng Products Corp.—**Willis W. Mansfield** has been appointed director of manufacturing.

General Electric Co., Metallurgical Products Dept.—**Robert G. Brierley** is now administrator of salaries and organization planning.

Progressive Welder Sales Co.—**John D. Gordon** has been elected vice-president and general manager.

Necrology

Roy H. Faulkner, 70, former president of the old Auburn Automobile Co. and Pierce-Arrow Motor Car Co., died Aug. 15, at Fort Wayne, Ind.

Charles A. Fisher, 58, a regional manager for Fargo Div. of Chrysler Corp., died Aug. 26, at Kansas City, Mo.

Lawrence R. Hills, 69, a retired sales executive for General Electric Co., died Aug. 25, at East Williston, N. Y.

Burt N. Pierce, 89, founder and board chairman of Emerol Manufacturing Co., died Aug. 23, at Westport, Conn.

Charles L. Corwin, 71, former sales manager for Champion Spark Plug Co., died Aug. 17, at Toledo, O.

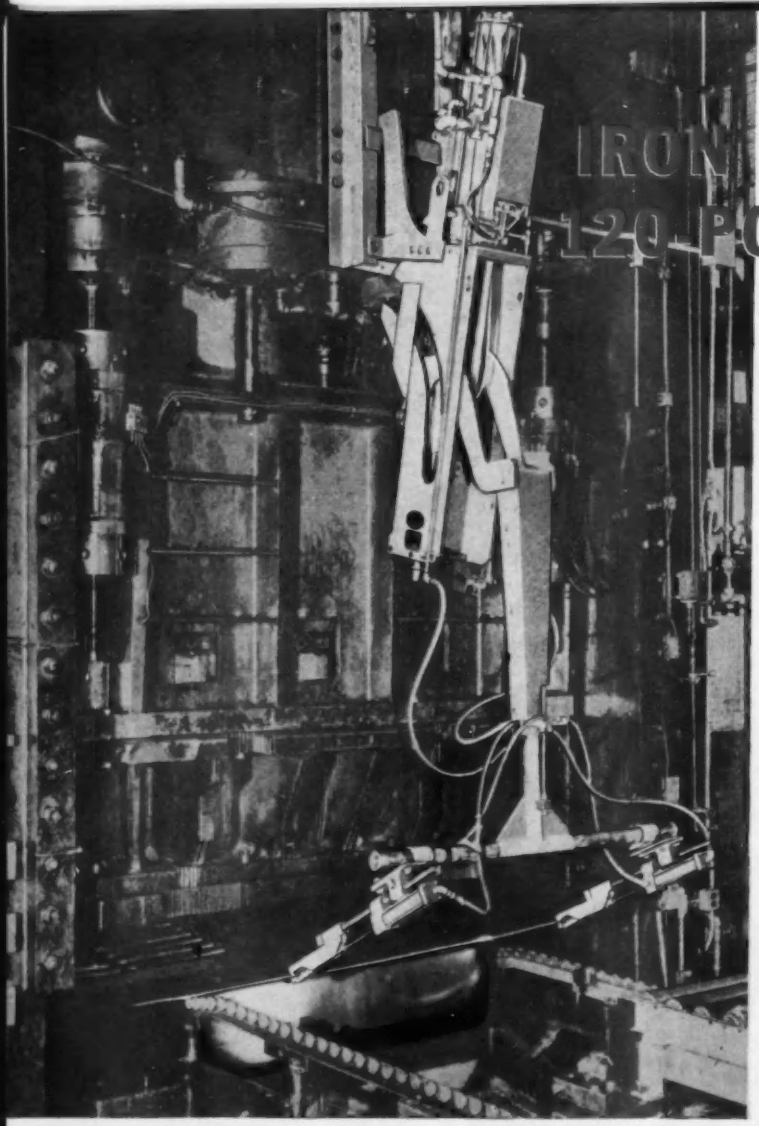
Alexander L. Long, 65, former vice-president and factory manager for American - LaFrance-Foamite Corp., died Aug. 21, at Elmira, N. Y.

Alan H. Beggs, 61, vice-president of Palnut Co., died Aug. 21, at Chatham, Mass.

Rudolf Feitl, 57, technical supervisor of Waldes Kohinoor, Inc., died Aug. 30, at Brooklyn, N. Y.

Arthur J. Boyer, 67, sales representative for E. F. Houghton & Co., died Aug. 20, at Philadelphia, Pa.

Hector McEachern, 56, superintendent of die construction in Plant 23 of Fisher Body Div., General Motors Corp., died Aug. 27, at Detroit, Mich.



IRON HAND UNLOADS 120-POUND BATHTUBS

...at Kaiser Metal Products

As fast as this 1800-ton press can deep draw these 120-pound bathtubs, the Iron Hand moves in, raises the tub, and swings it out onto a conveyor.

As a result of this installation at the Bristol (Pa.) plant, Kaiser Metal Products, Inc., was able to—

speed up production by utilizing full-rated press capacity

increase safety by transferring two men to another line

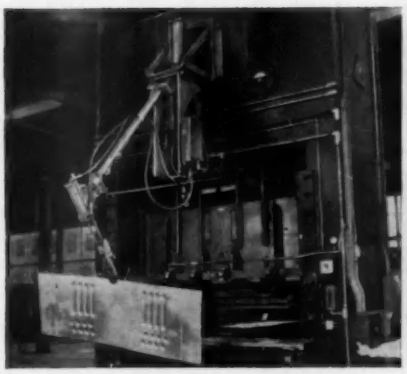
cut costs through greater output and lower labor charges.

Many other companies are finding the Iron Hand a low-cost, efficient production tool for virtually every type of sheet metal unloading. And here's why:

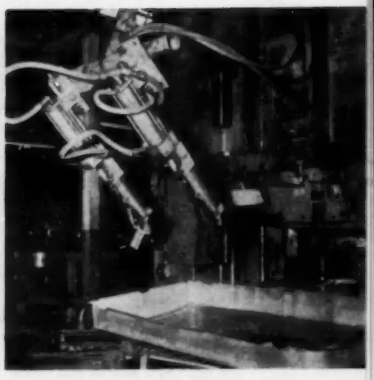
It's designed for fast installation, quick adjustments, and easy movement from press to press. With a wide selection of jaws available, the Hand can be adapted to a variety of stamped shapes.

Consider this: In every case a Sahlin Iron Hand brings you greater savings through higher output, increased safety, lower labor charges. You owe it to yourself to find out more about the Iron Hand. Write today for our new catalog.

BATHTUB BLANKS, of 14-gage steel, are fed to this 1800-ton double action press and are drawn to 15". Tubs weigh from 115 to 120 pounds, and are more than six feet long overall. Production rate: four to five a minute. Actually, Iron Hands can work at speeds up to 30 strokes per minute on medium size and large stampings. Because of the unusual nature of the blank, this model Iron Hand was specially-designed with double mounted jaw assemblies. Standard Iron Hands, equipped with single jaws, are ordinarily used to unload hoods, roofs, quarter panels and similar large stampings.



AT HOTPOINT—One of the many Iron Hands in use here, this one is shown unloading an eight-pound oven liner. Iron Hands unload practically any stamping.



ON REFRIGERATOR DOORS—A special Iron Hand is used to whip doors out of the die as fast as the press can make them.

SAHLIN IRON HAND

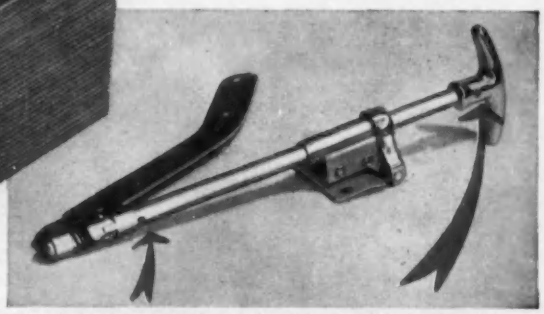
SAHLIN ENGINEERING COMPANY, INC.

P. O. Box 289, Birmingham, Michigan

OVERHEAD ARMS • FLOOR TYPE UNLOADERS • TURNOVER, TRANSFER AND LOADING MACHINERY

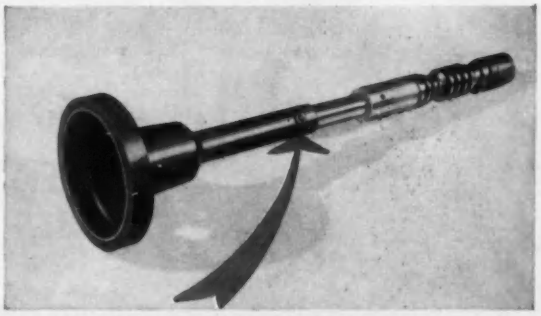
3 Better Methods with ROLLPIN

TO REPLACE A RIVET Rollpin's spring action firmly fastened radio transformer laminations in place and did two things a rivet couldn't do—aligned the laminations and compensated for minor hole variations.



TO REPLACE A STOP PIN Rollpin's self-locking action eliminated staking or peening operations required to retain a straight solid pin.

TO REPLACE A SET SCREW on automobile brake handle, Rollpin is self-retained in the hand grip but can easily be driven into overdrilled hole in shaft to free handle, then removed and used again.



TO REPLACE A DRIVING PIN for a flexible drive shaft on a washing machine, Rollpin cut assembly costs by eliminating precision drilling and reaming

Where can you use this simple fastener?

If you use locating dowels, hinge pins, rivets, set screws —or straight, knurled, tapered or cotter type pins, Rollpin offers the opportunity of a better method that can cut assembly and maintenance costs. This slotted tubular steel pin with chamfered ends eliminates special machining, tapping, and the need for precision tolerances. Driven into a hole drilled to normal production standards, it locks securely in place, yet can readily be drifted out and reused whenever necessary.

ELASTIC STOP NUT CORPORATION OF AMERICA

ROLLPIN TRADEMARK

MAIL COUPON FOR DESIGN INFORMATION

Elastic Stop Nut Corporation of America
Dept. R37-95, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastener information:

☐ Rollpin samples
☐ Rollpin bulletin
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone____ State_____

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Specify **conpor**

controlled porosity Sirvis mechanical leather

LOWER TORQUE

Specially treated Sirvis-Conpor members available in C/R Oil Seals greatly reduce torsional drag, won't score shafts. They provide positive sealing over longer service life, are completely self-lubricating. Write for detailed information.

MINIMUM FRICTION

Want low sliding friction in hot, fast, high pressure applications? Sirvis-Conpor cups and packings can be custom-treated to your most exacting specifications. Won't chatter, score cylinders.

BETTER POROSITY CONTROL

The wide range of Conpor treatments . . . from practically unfilled to virtually non-porous leather permits packings with exact leakage and lubrication control, increased life. Stable in a wide variety of oils, gases, solvents.

SIRVIS C/R DIVISION

CHICAGO RAWHIDE

CHICAGO RAWHIDE MANUFACTURING COMPANY

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Offices in 55 principal cities. See your telephone book.
In Canada: Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Hamilton, Ontario
Export Sales: Geon International Corp., Great Neck, New York

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C-R Shaft & End Face Seals • Sirvene (synthetic rubber) molded piston parts • C-R Non-metallic Gears

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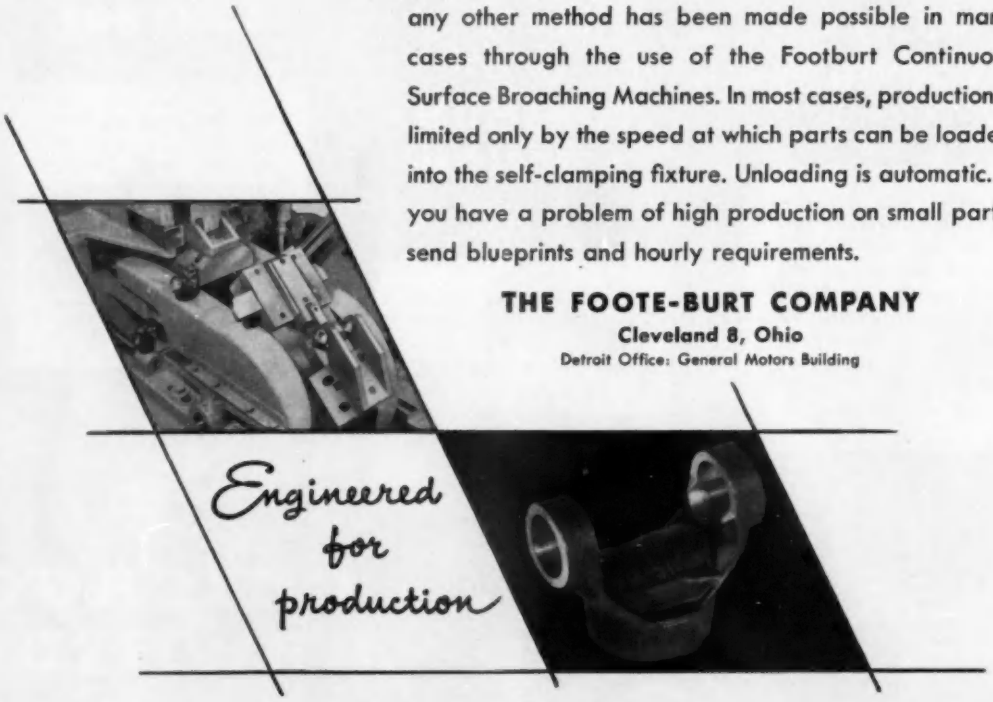
■ Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building



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PIONEERS IN SURFACE BROACHING

Effective sealing with confined resilient gaskets

In order to seal a metal-to-metal joint effectively, a gasket must meet at least two basic requirements. It must completely fill the recessed gasket channel to provide maximum contact with the mating flange . . . and it must be able to be compressed sufficiently to prevent leakage of the sealed medium.

cork-and-rubber gaskets

Both of these needs can be met with gaskets cut from truly compressible materials such as cork-and-rubber composition. (If non-compressible rubber gaskets are used, either relief must be provided for sideflow, or the gasket must be cut so that its volume does not exceed that of the cavity. Also, the initial shape of a rubber gasket must permit 20 per cent deflection when the joint is closed.)

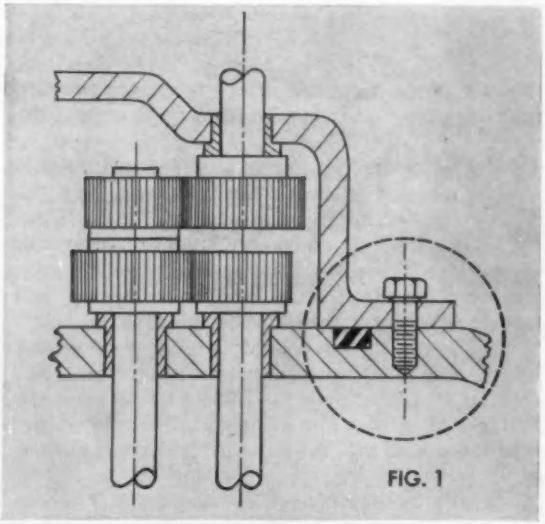


FIG. 1

filling the channel

To fill a channel completely, cork-and-rubber gaskets are cut to full channel width and, depending on their degree of compressibility, from 1.25 to 1.5 times channel depth. Because these cork-and-rubber gaskets actually decrease in volume under load, they do not require relief for sideflow or excessively close gasket and metal tolerances.

correct compression

Correct gasket compression is also assured with the right cork-and-rubber composition. Each cork-and-rubber material combines precisely controlled amounts of truly compressible cork and non-compressible synthetic rubber. As a result, a cork-and-rubber gasket can provide a pre-determined degree of compressibility to handle the required flange load.

typical applications

Typical of the metal-to-metal sealing jobs done by cork-and-rubber gaskets is the instrument housing flange shown in Figure 1. Completely confined, the cork-and-rubber gasket prevents leakage of the lubricating oil and permits perfect alignment of the gears.

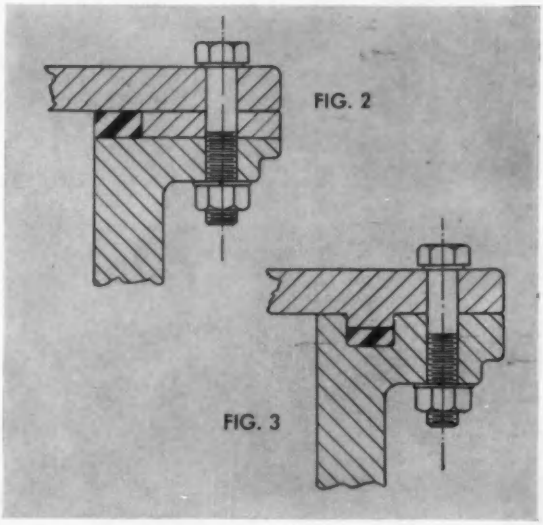


FIG. 2

FIG. 3

In Figure 2, flat flanges were adapted to metal-to-metal sealing by the insertion of an annular shim. Here, the cork-and-rubber gasket compresses to form a tight seal without tending to flow out of position.

The high pressure metal-to-metal flange shown in Figure 3 utilizes a stop to prevent blowouts. By completely filling the confined channel, cork-and-rubber maintains a tight seal.

SEND FOR 24-PAGE GASKET DESIGN MANUAL

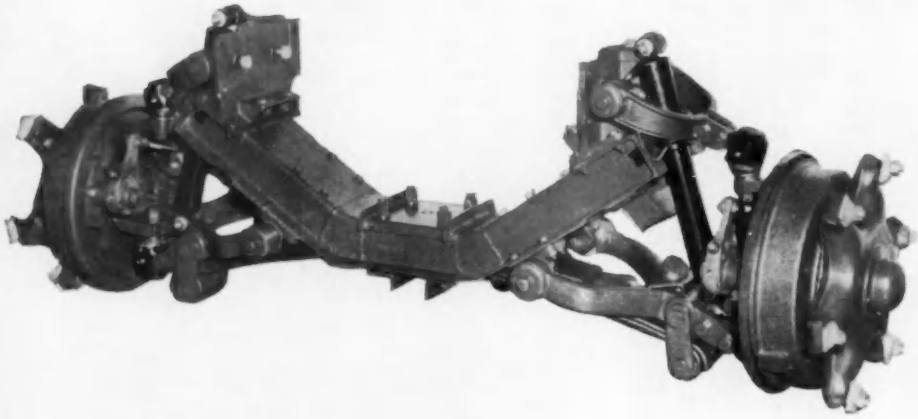
You'll find other useful information on the design and use of gaskets in the new Armstrong Gasket Design Manual. Write for your copy to Armstrong Cork Company, Industrial Division, 7109 Imperial Avenue, Lancaster, Pa. For information on all Armstrong Gasket Materials, see Sweet's product design file.

Armstrong

GASKET MATERIALS

. . . used wherever performance counts

New Heavy Duty Suspension Systems



This is the complete unit for the Clark independent front suspension for commercial vehicles (except buses). One of its important features is the provision of a torsionally stiff front cross member. As shown, the suspension embodies a semi-elliptic leaf cross spring which can be supplied to suit the load-carrying requirements for any vehicle.

Front Axle Assembly, with Leaf Cross Spring and Automatic Leveling Air Spring Suspension, Developed by Clark Equipment Co.

IMPORTANT advances are being made in suspension systems for commercial vehicles to provide better riding qualities and improved handling. Based upon a long range program of development, Clark Equipment Co., Buchanan, Mich., has just announced an entirely fresh concept of heavy duty suspensions which may be used singly or in suitable combinations, depending upon specific requirements.

Design analysis as well as considerable road testing has demonstrated to Clark engineers that variations in front axle loading—empty to fully loaded—are sufficiently small percentagewise, as a general rule, to be handled without automatic leveling, making air suspension unnecessary at the front, except on buses. On the other hand, the load variations on the rear driving axle of a truck or tractor and of tandem trailer axles are quite large and require automatic leveling to maintain good riding qualities. In all cases, as will be shown, this suspension system maintains effective static deflection values and low spring frequencies.

Specifically, the company now offers a radical form of front suspension consisting of an independently sprung front axle assembly, prepared as an integrated package, designed to replace the conventional front suspension of a given commercial vehicle. As illustrated, the assembly is complete in every detail. It employs a semi-elliptic leaf cross spring, and provides at the same time a torsionally rigid front cross member.

Extensive testing has proved that the roll stability of the suspension system depends largely upon the characteristics of the front suspension. In this Clark development the roll center is greatly improved by comparison with conventional or air spring suspensions, thus implying better ride, better control, and improved stability for the entire vehicle.

Since the current range of front axle loading in a specific group of vehicles ranges from 4000 to 11,000 lb, the front suspension is made in two sizes or capacity ranges. For each size cross spring characteristics can be tailored to suit the loading for a given application.

Automatic leveling air spring suspension of unique design, that has met all road test requirements and is ready to release for production, has been developed for the driving axles of trucks and tractors, and for trailer suspensions. Apart from its excellent ride characteristics, the outstanding feature of the air spring suspension is the fact that a single design of a single size is adaptable for use with single- or tandem-axle rears, for single or fixed tandem trailer axles, or for sliding trailer axles. It may be noted, too, that a single-axle suspension is simply half of a

By
Joseph Geschelin

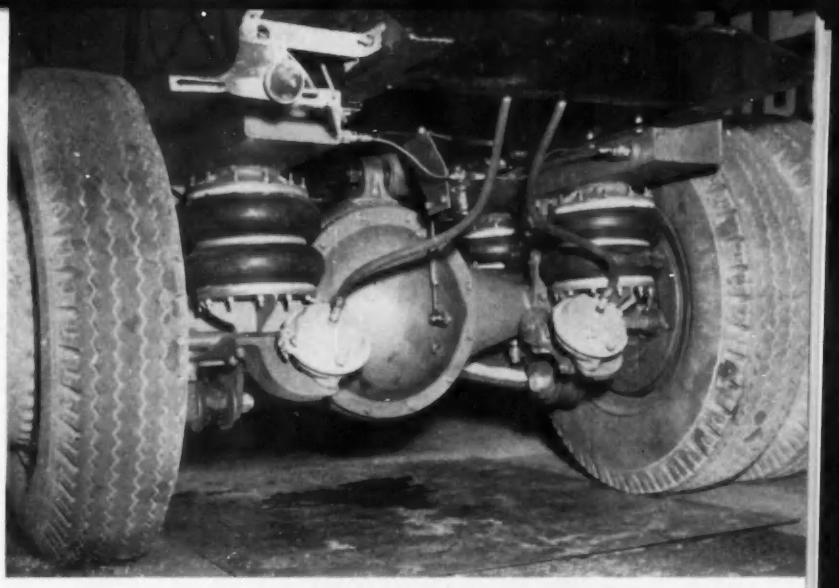
tandem unit, thus making for complete interchangeability of all parts regardless of type or make of vehicle. Needless to say, this makes for maximum production economy and minimum cost levels.

The elevation and side view of the tandem air spring suspension system are shown in the drawing. Examination of this drawing and the accompanying photographs will reveal that its design is unique. Basic air springs are of the familiar Firestone type and interchangeable for all suspensions. Doubtless the most important feature embodied in the unit is the means for providing stability. For this purpose there are two heavy, I-beam section radius arms fixed to brackets on the under side of the axle bed and held in position at the pivoted end in rubber bushings, mounted in the straddle-type bearing supports, which take side loads and position the axle laterally.

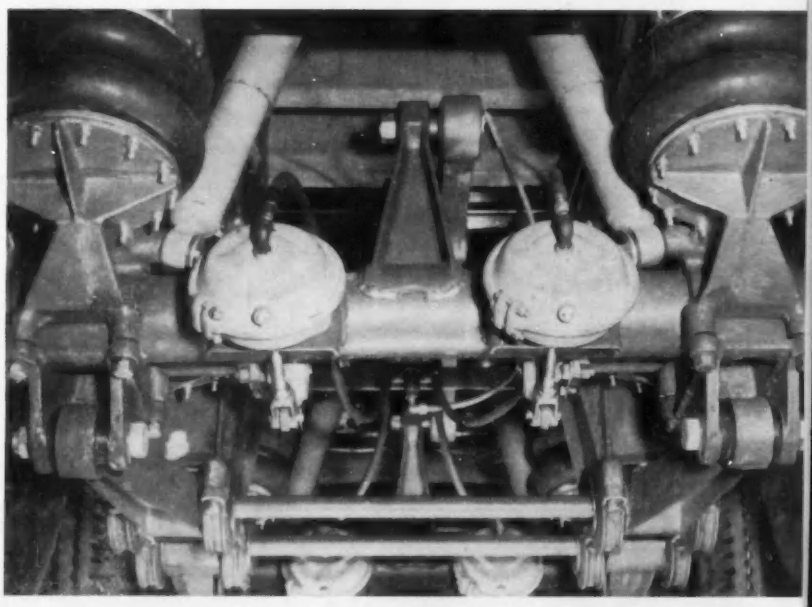
In addition, there is a heavy torque arm in the center, pivoted from a bell crank on the axle and fixed to the cross member at the center of the suspension. Its function is to relieve the axle of most of the torsional loading.

Conventional practice has been to install some form of externally mounted sway bar to control the

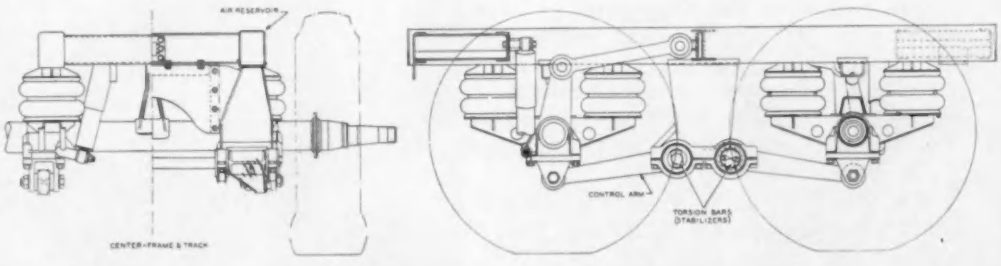
(*Turn to page* 154, *please*)



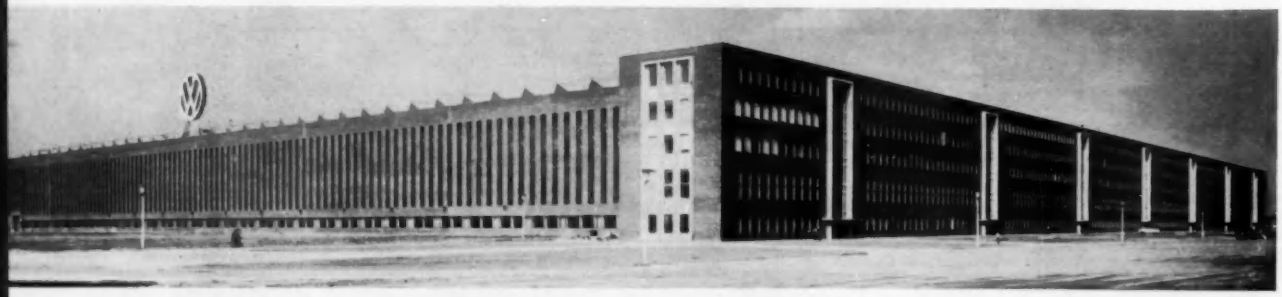
Rear view of a Clark tandem axle suspension installed in an experimental vehicle. It shows the Firestone air springs, and the air reservoirs on each side which serve as the attachment members for the suspension. One pair of radius arms may be seen attached to the brackets on the underside of the axle.



Here is a view looking into a portion of the automatic leveling suspension, showing the pair of torsion bars mentioned in the text. On each side they are splined into the radius arms which are seen partly at the extremities.



This drawing shows the elevation and side view of a typical Clark tandem axle air ride suspension. All of the major elements of the mechanism, described in the text, are seen in this view.



VW transporter with delivery van body

VW TRANSPORTERS *produced in* Europe's Newest Plant

PRODUCTION has just started in what is perhaps the most up-to-date automobile factory in Europe, the new Volkswagen plant at Hannover, Germany, where 3000 employes produce 200 VW transporters per day. This is a well-known light commercial vehicle, production of which began back in 1950 at a rate of 30 per day and which has met with success in many countries.

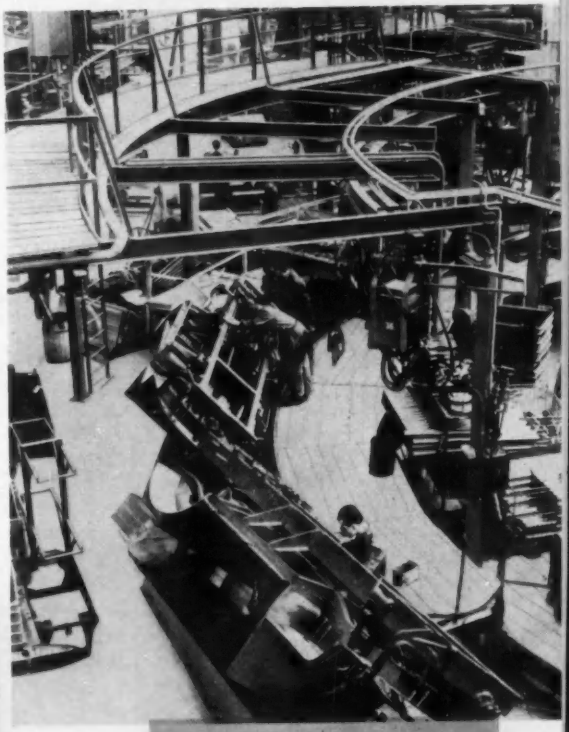
The transporter, which is powered by the aircooled 72.7 cu in. horizontally-opposed rear engine of the standard Volkswagen passenger car, has a payload of 1800 lb and weighs approximately 2400 lb. It has a usable interior space of 170 cu ft, a wheelbase of 95 in., and an overall length of 165 in. Eight body types are available.

For over five years this line was produced at the main Volkswagen plant at Wolfsburg. Now, however, only the engine and transmission will be made at the original plant, whereas other components and assembly are handled in the new factory at Stöcken near Hannover, approximately 60 miles distant from Wolfsburg.

The new facility has been designed and built for the production of this model only. All processes are carried out under one roof. Although automation is used for a certain number of operations and various new ideas are incorporated in the conveyor systems, the relatively modest production figure did not make it an economical proposition to build a genuine push-button factory.

All body parts are transported to the main assembly line by automatic conveyors, and the actual welding requires a minimum of manual labor. Practically no manual assistance, with the exception of the men in charge of the control boards, is necessary for the paint line with its automatic spray and drying booths.

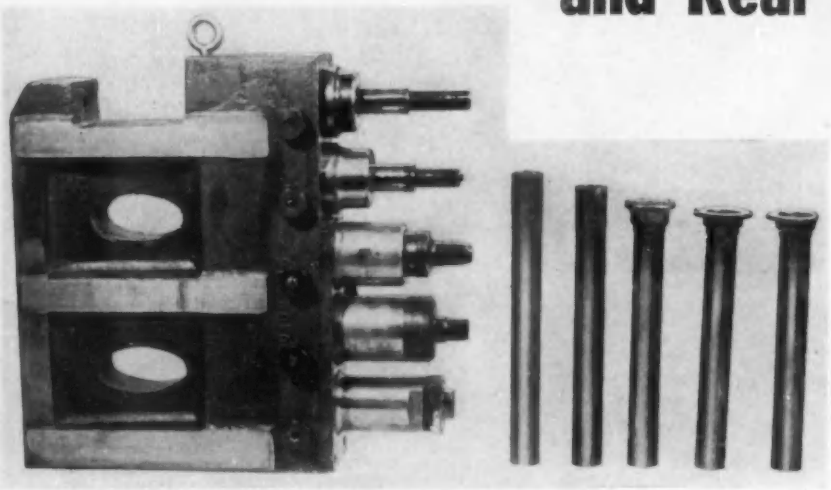
Automatic conveyor feeds presses for body components



Body side panels are automatically transported on main assembly line

Slow - running jigs keep body panels and understructure together during welding

Unique Setups for Making Powr-Lok Differentials and Rear Axle Tubes



View of National's five-station die slide. At the right are the five stages of tube forging, the one at the extreme right being the finished stage.

By Joseph Geschelin

WITH the introduction of the Powr-Lok differential, which has had such noteworthy acceptance on passenger cars and trucks, the Fort Wayne Division of Dana Corp. tooled a special line for producing the basic parts of the assembly. Since a number of the components differ from conventional design in some important respects, machining practice and other details have been developed specifically for the purpose. The Powr-Lok differential was described in AUTOMOTIVE INDUSTRIES, Feb. 1, 1956, page 52.

More recently the Fort Wayne division introduced another innovation, the installation of a National 6-in. upsetter, complete with unique automation, for forging the flange end on rear axle tubes. This setup will be described in some detail later in this article.

One of the interesting features of the Powr-Lok production line is the machining of the halves of the two-piece differential case in a new Bullard Type L lathe. It is a 12-in. machine, with six double stations, 12 spindles in all, a pair of halves being handled at each station with substantially the same operations. It may be noted at this point that although the halves are handled in pairs, selective assembly is not necessary since all parts are so machined as to be completely interchangeable.

The sequence of operations is as follows: 1st station; load both halves. 2nd station; rough turn all inside and outside surfaces. 3rd station; rough turn three faces. 4th station; finish turn all three faces. 5th station; finish turn all inside and outside surfaces. 6th station; finish the hub bore with floating reamer to provide accurate location for succeeding operations.

A distinctive feature of the Bullard setup is that one cycle completes all of the machining except the OD of the hub. It is noteworthy, too, that all of the turning and facing operations are performed with Goddard & Goddard combination tools, using cemented-carbide inserts.

Following the Bullard operation, the hub end of both halves is turned and faced in a Sundstrand automatic lathe. Prominent in the action of this differential is the V-shaped cam surface in each case half, serving as the cam for the cross shaft. This V form is produced by surface broaching in one pass in a Detroit horizontal broaching machine.

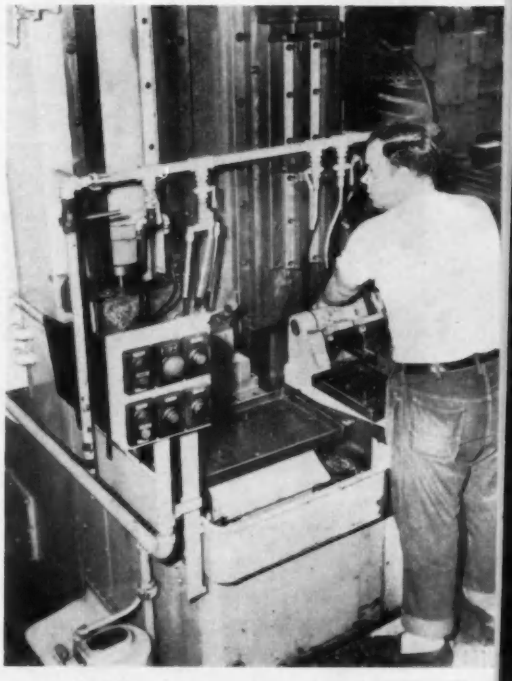
Both halves then are transported to Tocco induction hardening machines. Here the internal cone surface is hardened in one fixture; then the V ways are hardened in another operation.

Later the cone surface in each half is finish-ground in a Bryant internal grinder; while the Vees are finish-ground in a Norton grinder.

Following this the mating halves are assembled together, making up only four of the eight fastenings, using an Ingersoll-Rand multiple nut runner. The assembly then is presented to a single-end, two-spindle Ex-Cell-O precision type machine which turns the two outer bearings and also turns and faces the ring gear seat. This operation assures concentricity of the bearings with respect to the bore. Size is held to a total tolerance of 0.0015 in. while mounting dimensions are held to a maximum runout of 0.002 in. in all planes.

Cross pins for Powr-Lok are of unique design, consisting of two separate pins meshing together at the center of the assembly. A distinctive feature of cross pin machining is the special setup for surface broaching the center section and Vee ends in a vertical American surface broaching machine. As illustrated, the machine has two rams and each ram is served by two fixtures. The station at the left broaches the square slot in mating pins in one cycle. The station at the right is considerably more complicated. It has four sets of broaches: two pairs at the top, and two pairs below. Object of the setup is to broach the V at each end of two pins.

Covers have been removed to show the loading station and one of the working stations of the Bullard Type L, 12-spindle lathe. Availability of double stations makes it convenient to machine both halves simultaneously, using substantially the same kind of tooling.



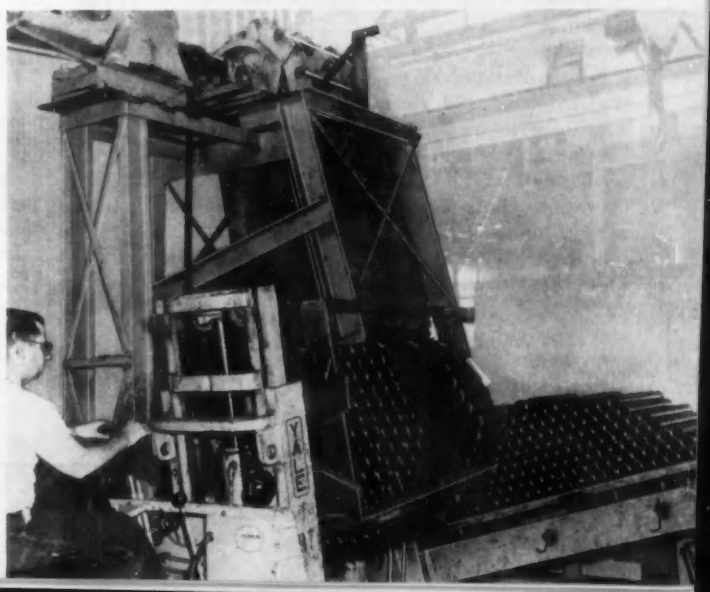
Close-up of work station of American vertical surface broaching machine in which the center section and Vee ends of cross pins are broached in two stages as described in the text. ▶

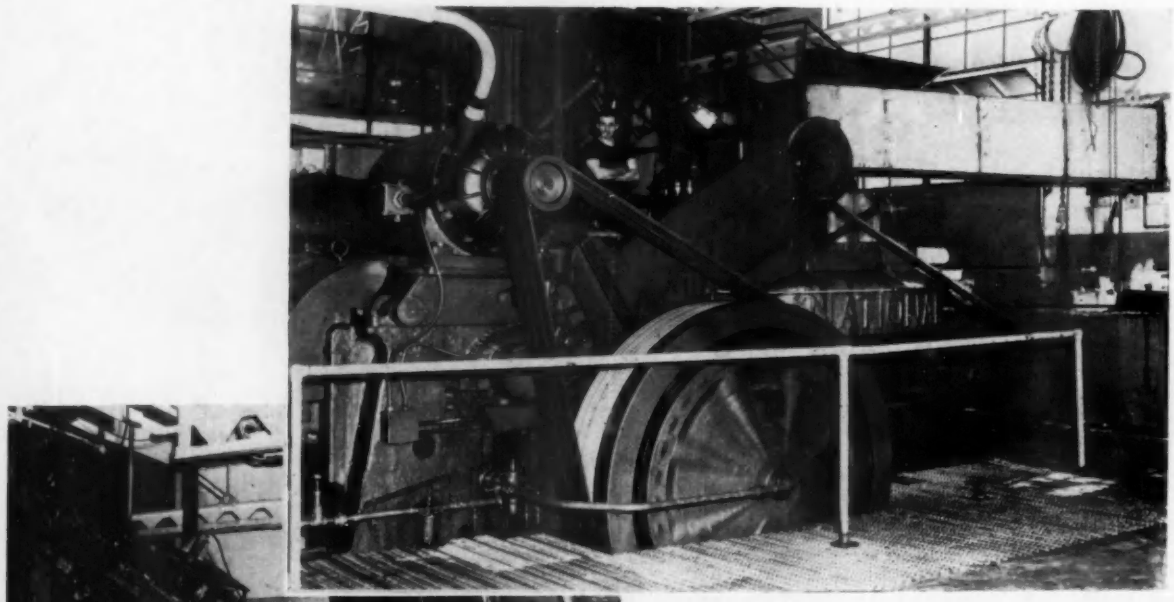
The first step is the broaching of one side of the V on both ends of each pin, i.e., broaching four flat surfaces. As the first cut is completed, each fixture automatically indexes the work to present the opposite side. The time interval for this indexing is equivalent to the time required for the ram to cover the gap between upper and lower pairs of broaching tools. From the standpoint of the viewer this is a continuous operation since the ram does not dwell during the completion of both cycles.

Except for somewhat different formations the bevel gears and side gears are processed in the same way as are similar gears in this plant. A noteworthy feature of bevel gear production at Fort Wayne is the introduction of a special burnishing operation as a part of the cycle in automatic screw machines, eliminating the secondary grinding operations that are customary in other plants.

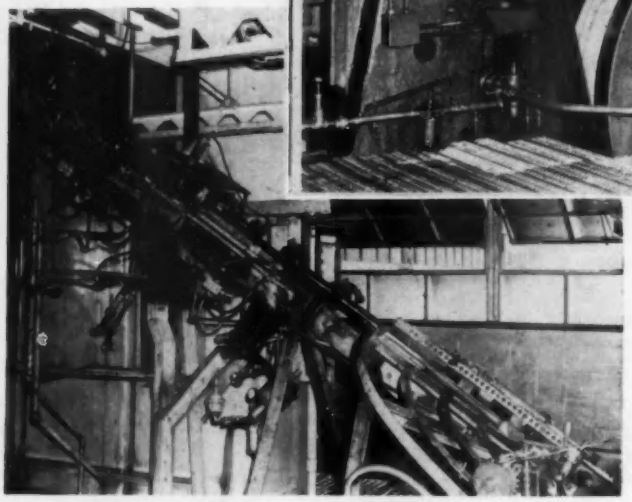
Latest innovation at Fort Wayne is the introduction of the tube forging machine. As illustrated, forging is done in a new National 6-in. upsetter, provided with tong feed and with a five-station die slide. The entire op-

Start of National tube forging operation. Here the lift truck operator may be seen delivering a bundle of tubes to the loading mechanism.





▲ *Guards have been removed to show the enormous National forging machine as installed in the Dana plant.*



◀ *This is the inclined conveyor, fitted with three Tocco induction heating stations for heating one end of each tube to forging temperature. The heated tube then drops into the special mechanism below for loading into the forging die.*

eration is mechanized for automatic cycle, and requires only two men—one at the controls, the other at the washer. Although the machine operates at 1200 cycles per hour, it has been timed conservatively to produce 600 pieces an hour.

To initiate the cycle, tubing cut accurately to length is delivered in bundles and placed on the automatic tube loading device by means of a fork lift truck. The loader is designed to remove one tube at a time from the magazine and elevate it on a continuous chain which carries the tube to a special Tocco induction heating unit. As illustrated, this consists of a gravity type slide traversing three induction heating coils. In operation, the tube drops down the slide and stops against an air-actuated stop for each heating cycle. In the first station the end of the tube is heated to 900 F; at the second station temperature is raised to 1500 F; at the third station temperature is elevated to 2100 F.

At this point the tube is released and drops by gravity into a special transfer device which changes the direction of movement of the tube. At the end of the stroke of the radius arm, the heated tube is released and falls into position in the magazine at the forging machine. The latter incorporates a positive feed mechanism actuated from the machine. At the proper time the tube in the magazine is lifted, permitted to roll forward and drop into a feed trough where it is in a position to be loaded into the first die by the action of the injector slide.

From this point on the movement of the tube through the five die stations is effected automatically by means of the tong loader. At the end of the fifth forging pass the finished tube falls clear of the die cavity and drops downward onto a single strand chain conveyor. Then the tubes are diverted onto an inclined elevating conveyor which transports them from the pit below the floor to floor level. The elevator then transfers tubes to a horizontal conveyor for transport to the washing machine.

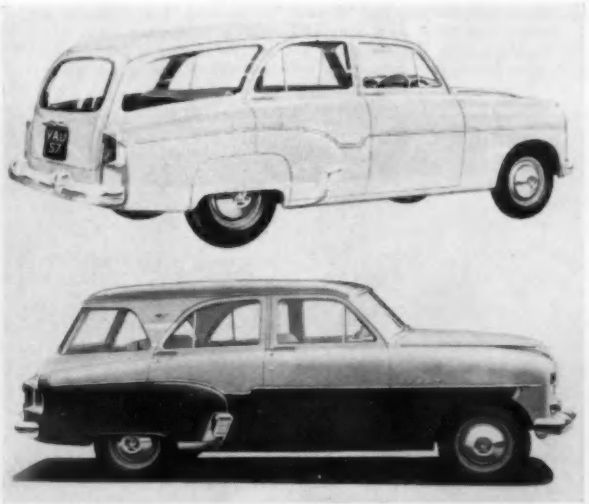
It may be of interest to note that, in view of the necessity for hardening certain sections of the differential case, the case halves are made of pearlitic malleable iron, produced by shell molding technique by Albion Malleable Iron Co.

PREVIEW OF 1957 British Cars

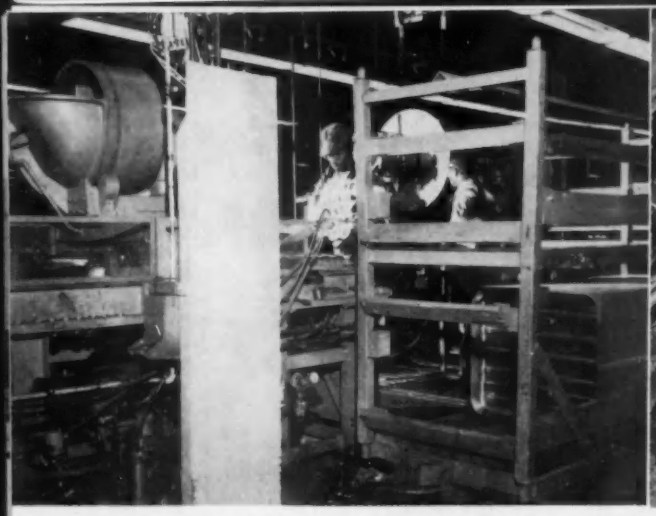
Station wagon version of the Standard Vanguard, with a cargo volume of 50 cu ft with the rear seat folded to the floor, has a 68 hp four-cylinder engine. Integral chassis-body construction keeps the shipping weight down to 2770 lb, and doors are lightened by the use of anodized aluminum extrusions for window frames. The tailgate is split horizontally.

The Standard Vanguard Sportsman is powered by the 127 cu in. Triumph TR3 engine. The four-cylinder unit with 8 to 1 compression ratio develops 90 hp at 4500 rpm, and drives through a three-speed gearbox and electrically-operated overdrive. Braking area is 175 sq in., giving 123 sq in of lining per ton weight.

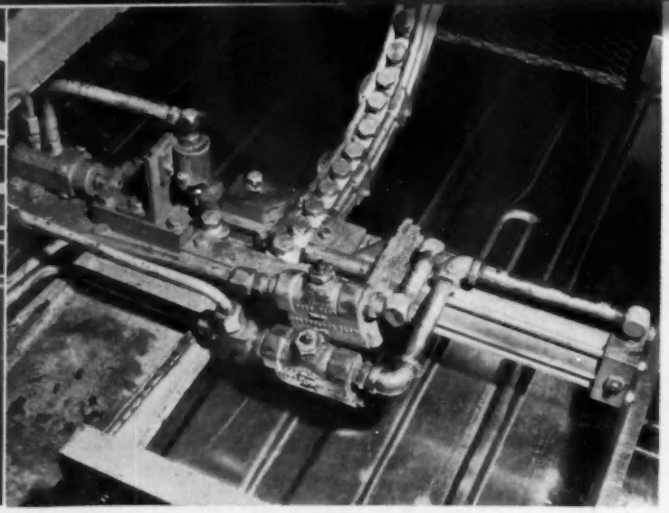
The 1957 Vauxhall Cresta, from General Motors' factory in Britain, has newly-styled tail lights, color side-panels, and front end treatment. The standard six-cylinder engine has the optional compression ratio raised to 7.7 to 1 to take advantage of the 100 octane gas now available in the U.K. This feature, together with an improved Zenith carburetor, is said to give better performance and fuel economy.



G.M.'s Vauxhall plant in Britain has unveiled two station wagons based on the six-cylinder Velox. Both feature quick conversion into a wide double bed, and in the Dormobile (left, above) the two seat backs can be dropped in five seconds to form a foam-rubber-spring mattress. Rear portion of the body is fabricated from glass-reinforced plastic and steel for strength and lightness. The one-piece rear door lifts open and locks horizontally in a single movement. The Grosvenor (left, below) has wrap-around side windows blending into the pillars at the split tailgate.



1 *Lower halves taken from tote racks at right are placed by hand, bottom up on the soldering machine conveyor (back of screen) which is indexed into and from successive stations, some of which are idle. A hopper feed for drain plug assemblies is above the next (idle) station.*



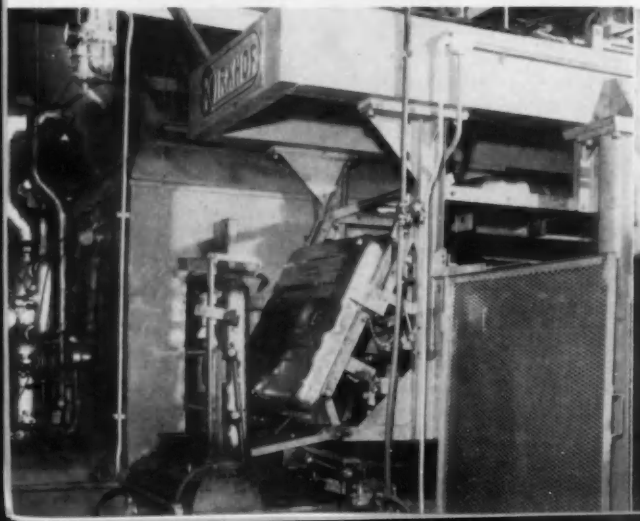
2 *Drain plug assemblies feed down the track here shown and are pressed into a hole in the lower half, which has been indexed so that the hole will register with the assembly placed in the hole.*

Fuel Tank Output Increased By Production Line Alterations

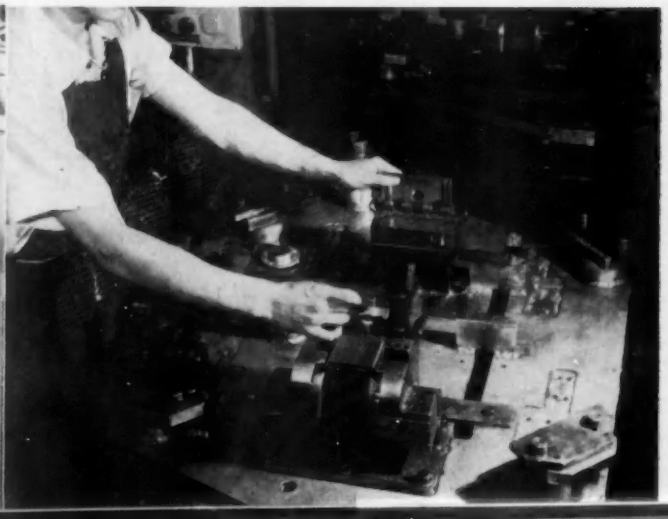
BY HERBERT CHASE

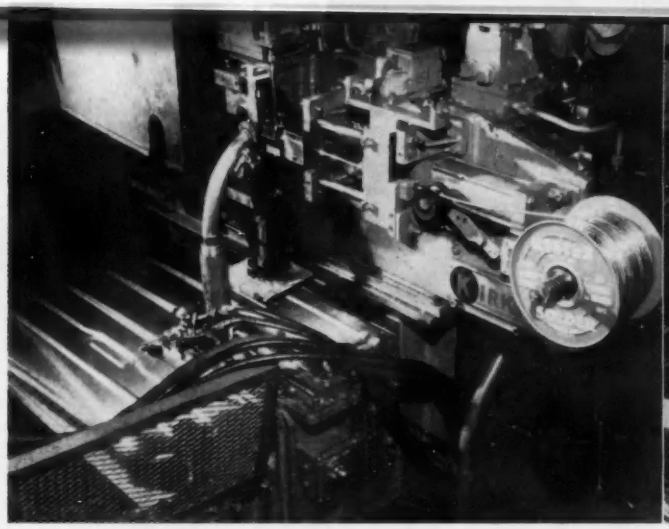
INCREASES in the production schedules made it necessary to up the output of fuel tanks by the Oldsmobile Division, General Motors, at its main plant in Lansing, Mich. Both halves of the tank are drawn from terne plate in the stamping plant, as before, and then are transferred in tote racks to a tank assembly line. As this line was already among the most modern in the industry and space available

6 *Looking towards the washer into which a lower half, in vertical position behind the screen (right) is being fed. The upper half, shown in position on the washer loader, will be placed on the washer conveyor as soon as the preceding upper half has cleared the station.*

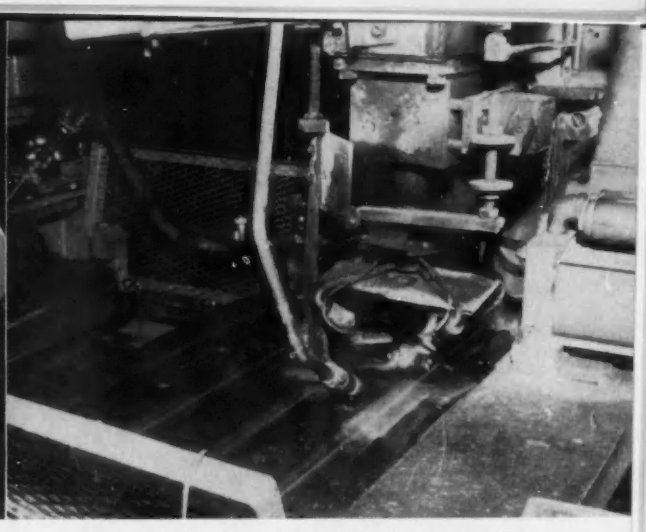


7 *Upper halves are fed through a piercing operation in a press and then pass parallel to the soldering line and are mechanically loaded onto the fixture in background. An operator loads two braces, a reinforcement and a fuel gage ring into the fixture.*





3 *At this station, the Kirkhof machine shown draws core solder from a reel, forms a ring from a measured length that is cut off and drops the ring via a tube over the plug assembly in the lower half to be soldered.*



4 *After indexing the lower half to this station, gas flames directed from nozzles around the plug assembly apply heat sufficient to melt the solder and cause it to run into the joint it forms between the assembly and lower half.*

for changes was very limited, means for increasing output greatly without substantial space increase had to be found.

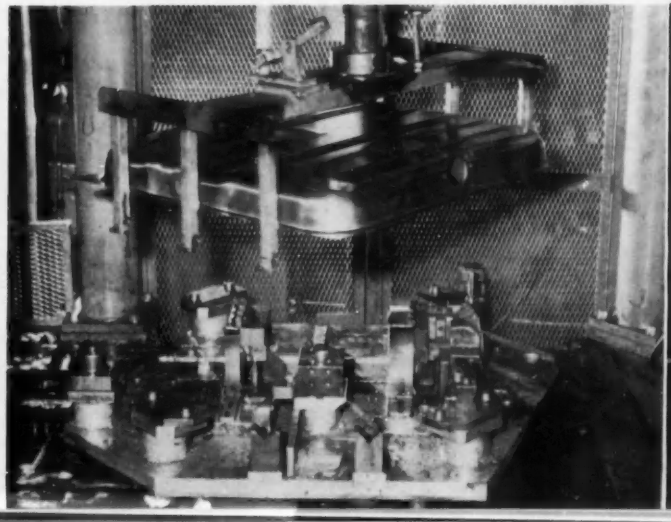
In the prior setup, one pair of welder wheels produced the entire seam weld on each tank including turns around corners. Now there are two welders, each having two pairs of wheels. Each of these machines makes a pair of parallel straight line welds, one along each side, and these two pairs of welds cross near the four corners of the mating flanges of the tank.

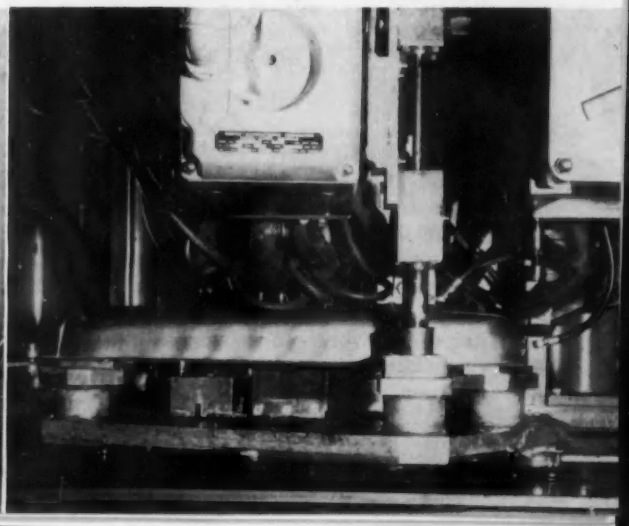
Total seam welding time is much decreased, partly because

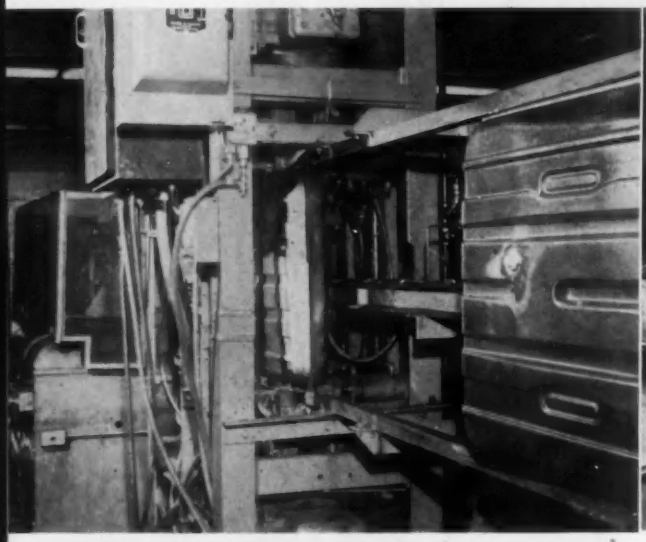
5 *Following quenching and cooling at the station in the foreground, the lower half is tilted 90 deg by an electromagnetic unloader so as to stand on edge for advance through a washer by a conveyor that runs at right angles to the soldering conveyor. This washing removes soldering flux.*

8 *Twenty spot welds fasten minor parts inside the upper half of the tank.*

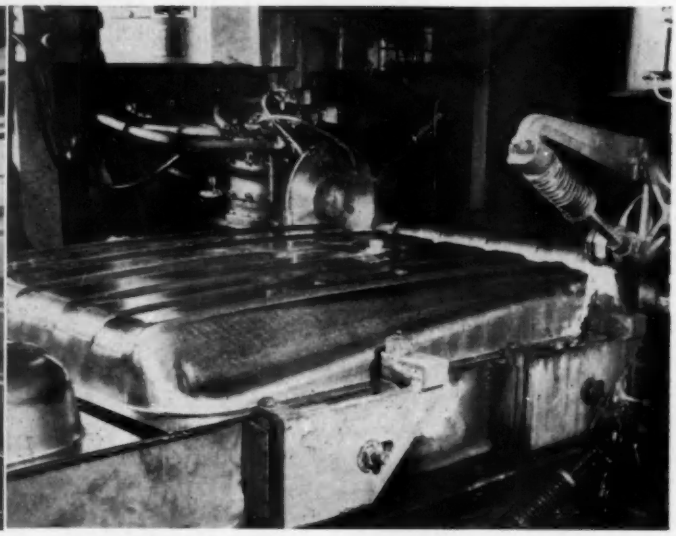
9 *After the upper half is unloaded from the weld fixture shown here, the assembly is transferred, tilted on one edge and is fed through the same washer as the mating lower half, which it faces as washing proceeds.*





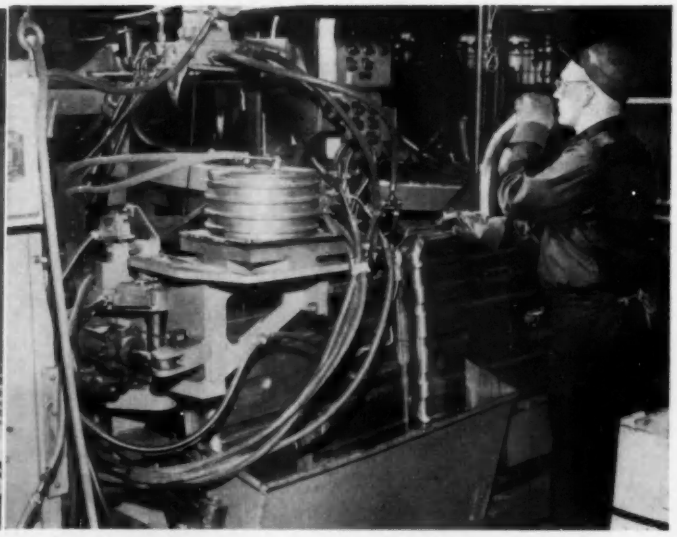


10 *As upper and lower halves leave the washer, they meet and their mating flanges are brought together and into registry. Then the two halves feed into this Taylor-Winfield welder and two spot welds are made top and bottom to hold the halves in correct relative position.*



11 *After leaving the spot welder, the assembly issues from the conveyor track onto a belt and is transferred horizontally so that two pairs of flanges pass through the Taylor-Winfield seam welder that makes parallel straight line welds along two sides.*

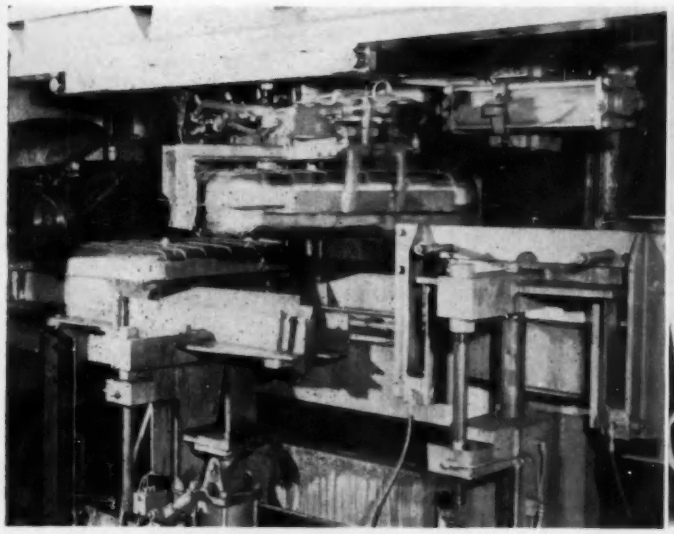
14 *From the press, tanks feed onto two parallel conveyors, one for tanks to be delivered to B-O-P plants, without filler necks attached, and one for the local Oldsmobile plant. On the latter line, the filler neck is applied along with a ring of solder.*



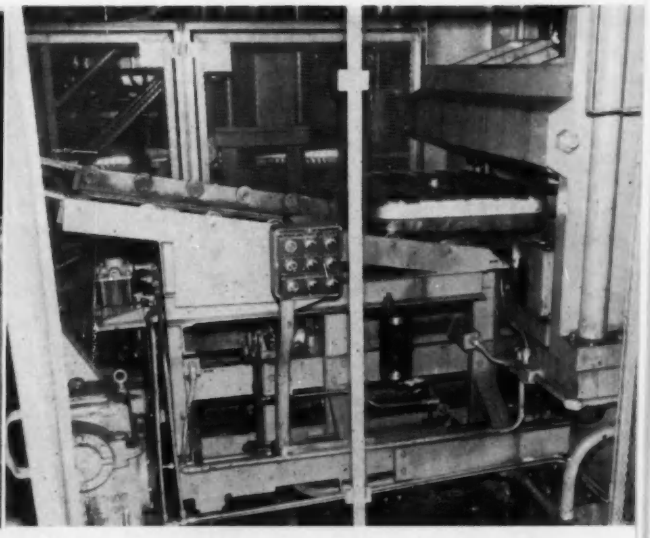
15 *Tanks with filler necks loosely assembled enter this machine where, with the neck held in correct position by a fixture and the solder ring inside an induction coil; the latter applies heat to melt the solder. Current is then shut off and water is fed onto the joint to cool the solder. The tank then is submerged and pressure tested. B-O-P tanks are similarly tested but without neck or gage, which are shipped separately.*

the two welders are arranged in series, each doing half the welding and both welding simultaneously, the tank being turned 90 deg between the two machines. Other operation rates have been increased in proportion. In the former line, capacity was about 140 tanks an hour. In the new one, about 300 an hour can be completed.

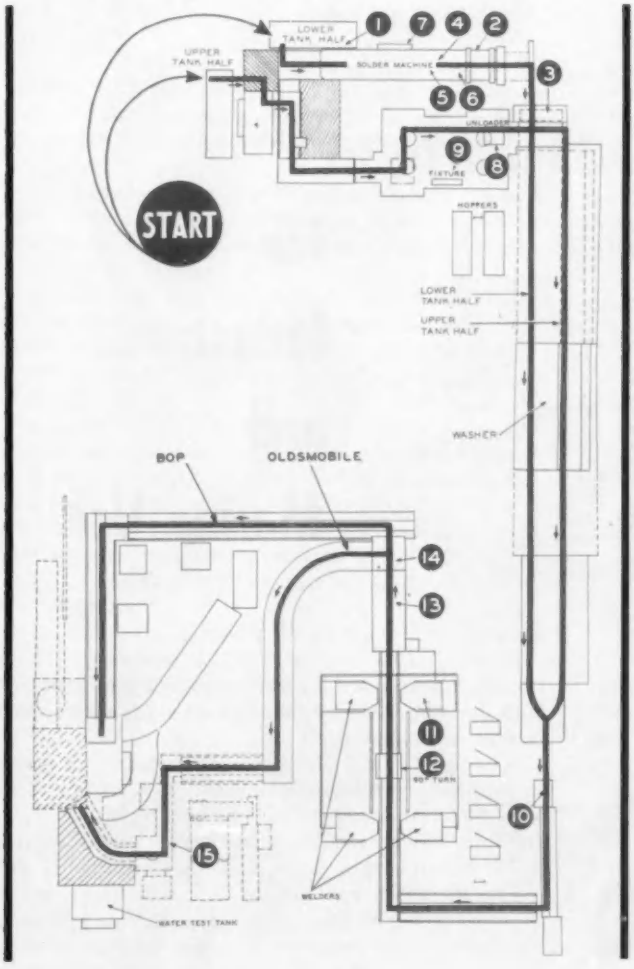
Drawing on opposite page shows the new floor layout. Numbered arrows indicate the points at which similarly numbered photos were taken and the directions in which the camera was aimed for the successive shots. Illustrations show in succession 15 of the major operations. The illustrations across the



12 *When the first two welds are completed, the tank is picked up by this fixture and is turned 90 deg while remaining horizontal. Thereafter, the tank is advanced and deposited onto a conveyor for feeding through a second welder that produces two more parallel seam welds. These cross the prior pair at right angles near flange corners.*



13 *Upon leaving the second seam welder, the tank feeds down a roller conveyor into the press at the right. This press turns down four corners and two side anges and produces strap notches in the other two flanges.*



top of pages 56 and 57 show operations on the lower half of the tank. Illustrations across the bottom of pages 56 and 57 depict operations on the upper section. All illustrations on pages 58 and 59 conclude with operations on the tank as assembled.

• • •

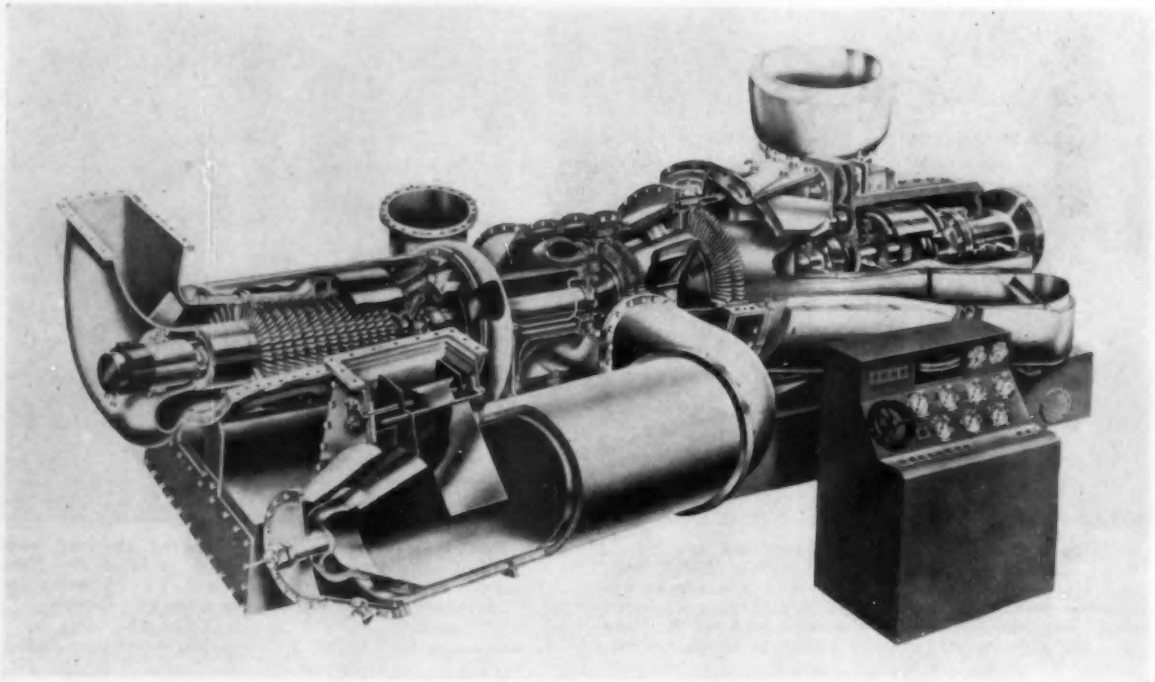
AAA Contest Board Sets New Program In Motion

The contest board of the American Automobile Association, which for more than 50 years was the controlling body for all important automobile races in the U. S. until it withdrew sponsorship last year, is assuming a new role.

Since it feels that racing has already made its ultimate contributions to automotive developments, AAA has set in motion an ambitious program for the board. Its principal function now will be to test performance of current and new products and to certify the results.

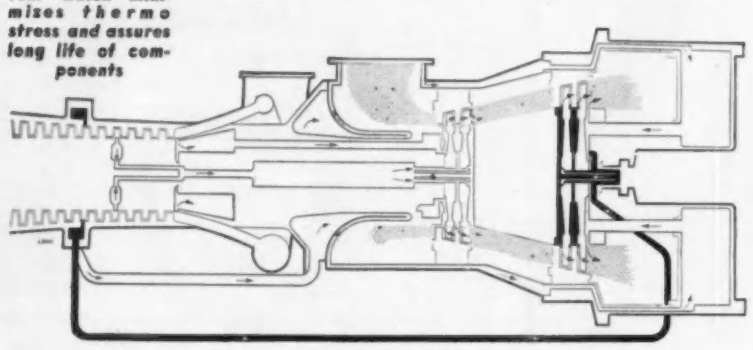
The board, which will act as a liaison between car manufacturers and the motorist, is looking forward to testing of new engine designs, such as the turbine, the small Diesel and free piston units, injectors systems, and new spring suspensions that automatically adjust the car to every condition of road and load.

Testing work will involve the use of laboratory, the salt beds of Utah, and the manufacturers' proving grounds or speedways.



Cutaway view of the Clark Mark TA, 1130 bhp, gas turbine

New Gas Turbine for Industrial and Marine Use



Air cooling system which minimizes thermo stress and assures long life of components

CLARK Bros. Co. of Olean, N. Y., has compieted an agreement with Rushton-Hornsby Ltd., Lincoln, England, for the manufacture and sale of the Ruston Mark TA gas turbine in this country. The Mark TA, which develops 1130 bhp, is similar in design to the Clark Type 302, 8500 bhp gas turbine. It features light weight, compactness, air cooling, and fuel flexibility.

The new unit is said to be suited to stationary or portable power generation and to marine and industrial mechanical drives. Typical areas of use are gas and fluid transmission where the variable speed or high starting torque characteristics of a two-shaft turbine are required.

It is equally well suited to processes where power is required and where the exhaust energy can also be used for pre-heating, or for the generation of steam. Its light weight and small size permit the Mark TA to be used in barges, boats, trailers, second floors, etc.

The Mark TA gas turbine is a dual shaft, series flow unit which develops 1130 bhp at 80 F and 1000 ft. The nominal low pressure or output turbine speed is

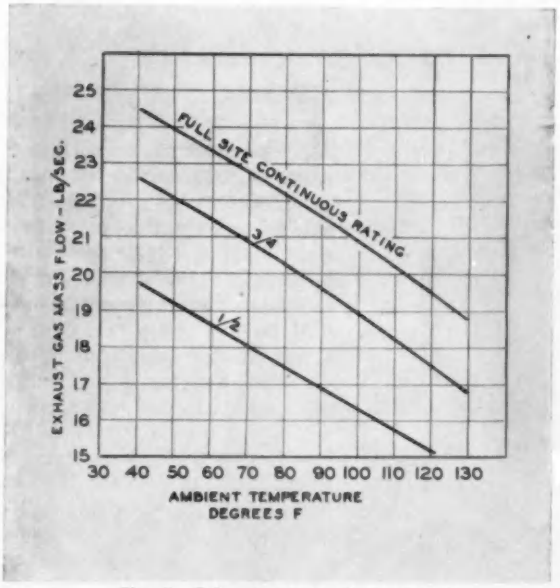


Fig. 1—Exhaust gas heat recovery

TABLE 1

Influence of Back Pressure on Output

Back pressure at site:				
Continuous rating, in. of water	2	4	6	8
Reduction at all loads, bhp	30	55	75	90

TABLE 2

Thermal Efficiency at Full and Part Load

Loading, %	Efficiency, %*
100	15.1
75	13.4
50	11.0

* Based on lower heating value.

6000 rpm. Output speeds of 1500 and 1800 rpm are available for driving 50 or 60 cycle generators. These speeds are obtained through the use of built-in planetary gears.

Variations of the low pressure turbine speed in either direction from the standard 6000 rpm will result in a slight variation in power output for a given turbine inlet temperature.

Temperature and altitude have the usual influence on the turbine rating. A 3.5 per cent reduction of output is required for every 1000 ft increase in altitude; a 5 per cent reduction or increase for every 10 deg F above or below 80 F.

Applications of this turbine have been a combination of waste heat utilization and power generation or mechanical drive. The curve in Fig. I shows the exhaust gas mass flow vs ambient temperature with parameters of brake horsepower. It should be noted that the turbine must be derated in accordance with Table 1 when the back pressure is raised with a waste heat boiler.

The turbine is designed for normal operation at an inlet temperature of 1340 F, and the design permits full load within two minutes of initiating starting cycle. The power plant weighs approximately six tons.

Combustion air is supplied by a 13-stage axial flow compressor at a pressure ratio of 4.0 and a flow of approximately 22 lb/sec. The compressor is driven through a flexible coupling by the high pressure turbine at approximately 11,500 rpm. The rotor is of disk construction with blades mounted between the disks. A central, prestressed bolt ties the assembly together.

Combustion of the fuel is in a single, elbow-type combustion chamber with a single burner. The chamber consists of two shells forming an inner combustion area and an outer annulus, and it can be mounted in a number of different positions to suit installation requirements.

The high pressure turbine, which is a two stage unit, operates at a speed of 11,500 rpm driving the axial compressor. The low pressure turbine, which is also a two stage unit, operates at 6000 rpm. Rotating blades are machined from bar and unshrouded. Blading of both compressor and turbines is designed on the free vortex principle.

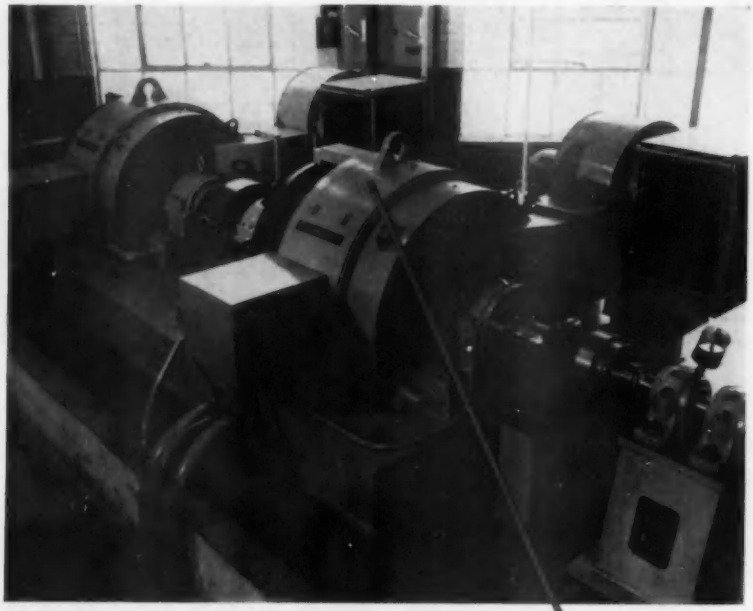
Turbine blades are anchored to the high temperature stainless steel disks by broached, fir-tree type serrations. The stator blades are also machined from bar and mounted in 12 segments which are free to expand without disturbing the outer casing. The outer casing is cooled by air from the compressor and therefore retains the stator blades concentric with the rotor and controls the running clearances. Both blade roots and disks are cooled by air from the axial compressor.

Bendix Division Gets Order For Flight Control Systems

Eclipse-Pioneer Division of Bendix Aviation Corp. has received a $2.5 million order for production of PB-20 automatic flight control systems. Designed for the Boeing 707 jet transports, first all-jet airliner slated to be placed in scheduled commercial airline service, the control systems utilize transistors and magnetic amplifiers in place of vacuum tubes.

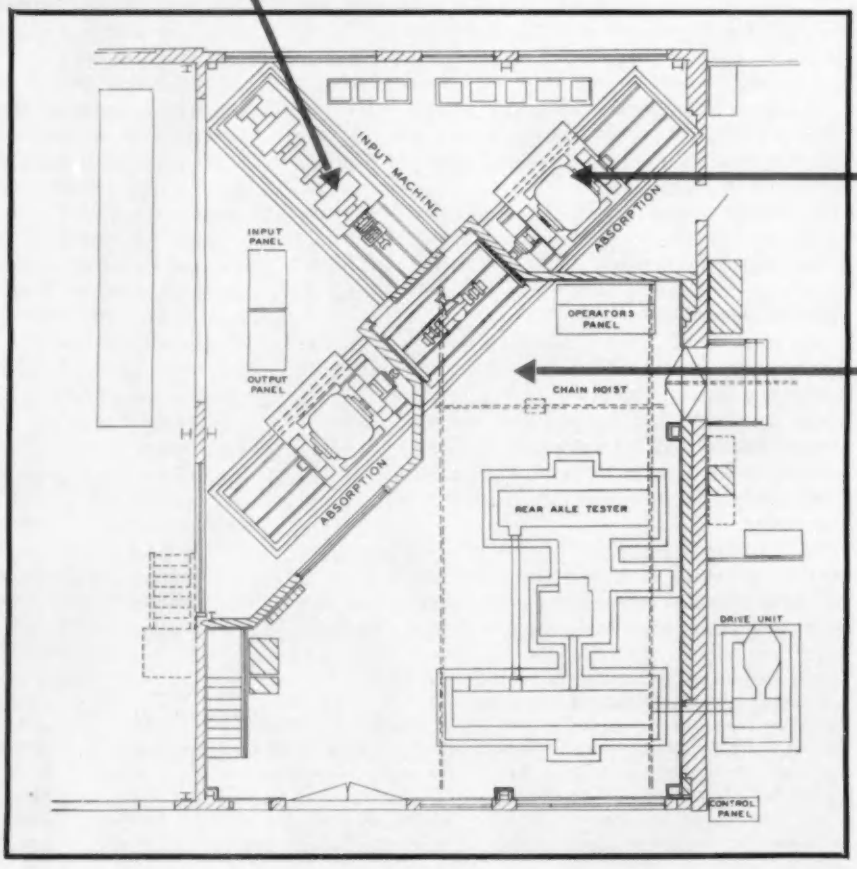
One of the advantages of the new system over those now in use is that it can intercept a radio navigation beam from any approach angle. Deliveries of the new systems to Boeing are scheduled to begin next April.

Huge Dynamometer Setup



View of motoring equipment installed by Westinghouse. The axle under test is located at the extreme right out of view.

IN conducting a continuous research program for new and better materials for critical rear axle parts, as well as increasing load carrying requirements, International Harvester Co. recently installed an extensive laboratory facility at its Fort Wayne Works devoted exclusively to the accelerated testing of heavy duty rear axles. As this new facility gets under way, it is anticipated that the manufacturing division will obtain the necessary test data to evaluate the variety of available gear steels and their heat treatment as well as much needed information as to the en-



FLOOR PLAN of the DYNAMOMETER TEST ROOM

EXHIBITORS AT THE NATIONAL AIRCRAFT SHOW

for Testing Heavy Duty Rear Axles

durance and load-carrying ability of the various components.

Up to the present time such basic data have been difficult to obtain, primarily because of the limitations of existing test machines. It is well known that all producers of rear axles and differentials have been hampered in this area of investigation by the limitations of equipment available to date.

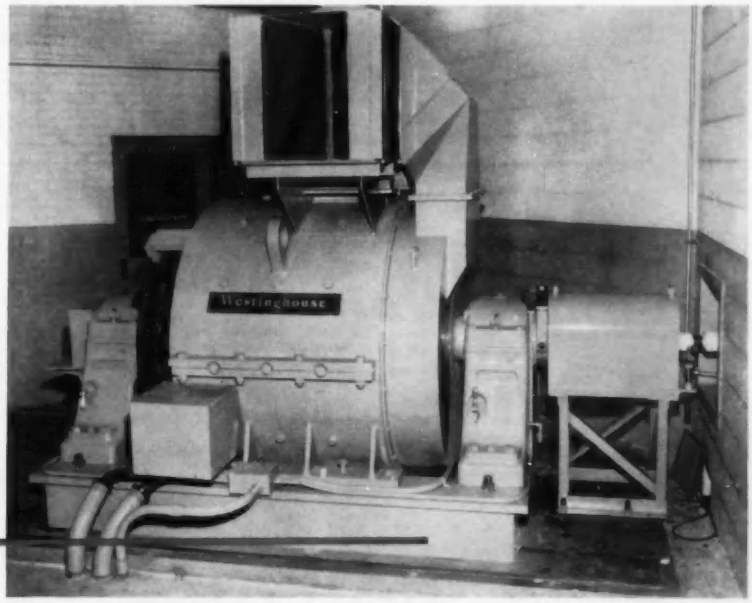
Specifically, the company has installed at Fort Wayne the first example of an electric dynamometer for rear axle testing of a type which makes it possible to apply input power directly to the axle without any intermediate gearing; and to absorb power at the axle ends directly and without intermediate gearing. All of the electrical machinery, including motor generator sets, electronic controls, etc., was supplied by Westinghouse Electric Corp.

This enormous piece of equipment is capable of absorbing up to 40,000 lb-ft of torque, a torque potential that unquestionably exceeds the capacity of any existing truck engine; and probably exceeds anything that is contemplated many years in the future.

As shown in the floor plan, the motoring (input) dynamometer is in the center of the "T," transmitting power directly to the axle through a propeller shaft. The two absorption dynamometers are mounted at the axle ends as shown. The operating cycle is controlled from the master console at the right. Electrical controls are so designed as to reverse the nature of the operation, permitting the absorption dynamometers to shift to motoring and the input machine to shift to an absorption dynamometer when required.

Westinghouse also has incorporated feedback into the sys-

(*Turn to page* 150, *please*)



Here is one of two absorption machines—one at each axle end. Note that all Westinghouse electrical machinery installed in this test cell is protected by filters such as the one seen mounted over the machine.

Perspective of test area with its sound-proofed walls and ceiling. The Westinghouse control console is at the right; the rear axle under test at the left. The operator at the axle may be seen using a special stethoscope in probing for noise.

EXHIBITORS AT THE NATIONAL AIRCRAFT SHOW

Acme Steel Co., Chicago
Aero Design & Engineering Co., Bethany, Okla.
Aerojet-General Corp., Azusa, Calif.
Allison Division, General Motors Corp., Indianapolis
Arma Division of American Bosch Corp., Garden City, N. Y.
Bell Aircraft Corp., Buffalo
Bendix Aviation Corp., South Bend
Boeing Airplane Co., Seattle, Wash.
Chance Vought Corp., Dallas
The Cleveland Pneumatic Tool, Cleveland
Curtiss-Wright Corp., Wood-Ridge, N. J.
Douglas Aircraft Co., Santa Monica, Calif.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Fairchild Engine & Airplane Corp., Hagerstown, Md.
Ford Motor Co., Aircraft Engine Division, Chicago
The Garrett Corp., Los Angeles
General Binding Corp., Chicago
General Electric Co., Schenectady, N. Y.
Grand Central Rocket Co., Redlands, Calif.
Grumman Aircraft Engine Co., Bethpage, N. Y.
Hartzell Propeller, Inc., Piqua, Ohio
Hughes Aircraft Co., Culver City, Calif.
Indiana Gear Works, Inc., Indianapolis

Speed and Endurance Records Set at 1956 NATIONAL AIRCRAFT SHOW

THE 1956 National Aircraft Show, held in Oklahoma City over the Labor Day week-end, was noteworthy for the number of new records established. Attendance of nearly 152,000 at Will Rogers Field was excellent, but obviously could not compare with the 289,000 mark of 1955 when the event was held at Philadelphia.

Many speed marks fell in the supersonic exposition, which saw new records set in races for the Bendix, the General Electric, the McDonnell, the North American, the Douglas and the Thompson trophies. The Thompson Speed Run, climaxed the aerial exposition with a new national air-dash record of 1015.428 mph.

The airborne classic featured demonstrations of precision flying, square dancing helicopters, solo stunt men, formation fly-overs and aerial glimpses of such planes as Lockheed's F-104A, shown for the first time to the general public.

On the ground, records also tumbled as mechanics

Irwin Laboratories, Los Angeles
Joy Manufacturing Co., Pittsburgh
Kelsey-Hayes Wheel Co., Detroit
Klincher Locknut Corp., Indianapolis
Lear, Inc., Wichita, Kan.
Link Aviation, Inc., Lockheed Aircraft Corp., Burbank, Calif.
Lycoming Division, Stratford, Conn.
Glenn L. Martin Co., Baltimore, Md.
McDonnell Aircraft Corp., St. Louis
Midland Air Associates, Inc., Midland, Texas
Niforge Eng. Castings, Inc., Boston
North American Aviation, Inc., Los Angeles
Northrop Aircraft, Inc., Hawthorne, Calif.
Phillips Petroleum Co., Bartlesville, Okla.
Pioneer Parachute Co., Inc., Manchester, Conn.
Pyrene-C-O-Two Division, the Fyr-Fyter Co., Newark, N. J.
Ramo-Wooldridge Corp., Los Angeles
Reaction Motors, Inc., Denville, N. J.
Republic Aviation Corp., Farmingdale, N. Y.
Plastic, Inc., Poteau, Okla.
Sikorsky Aircraft, Stratford, Conn.
Slick Airways, Inc., Oklahoma City
Sperry Gyroscope Co., Great Neck, N. Y.
Stroukoff Aircraft Corp., West Trenton, N. J.
Sundstrand Aviation, Rockford, Ill.
The Texas Co., New York
Thompson Products, Inc., Cleveland
Trans-world Airlines, Oklahoma City
Tubing Seal Cap, Inc., San Gabriel, Calif.
United Aircraft Corp., Pratt & Whitney Aircraft Div., Hartford, Conn.
United States Steel Corp., Pittsburgh
Westinghouse Electric Corp., Pittsburgh

USAF-Northrop Snark SM-62 intercontinental missile. This winged, pilotless bomber is said to be capable of delivering an atomic warhead over transoceanic distances

The Navy's first primary jet trainer, the Temco TT-1. It was demonstrated publicly for the first time at the show.

from Webb AFB in Big Spring, Texas, changed an Allison J-33 jet engine in record time to win the Allison trophy given to the team of mechanics who can take the engine out of a Lockheed T-33 and replace it with another in the fastest time.

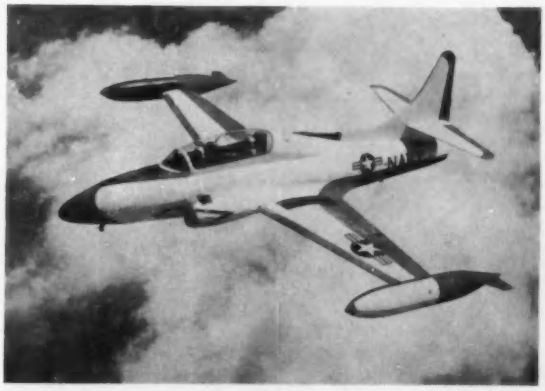
Another record was established by a Hiller H-23 helicopter, which spun in the air continuously for a new endurance mark of 57 hours, 45 minutes.

The Air Force, Navy and Marines—along with more than 50 commercial aircraft companies and allied industries—filled a gigantic arena with the latest in aerial wares, taking the wraps off some of the aircraft developments for the first time. The military services played the major role in the show, with the Navy coming in for a large share of the glory.

It was the Navy-Chance Vought F8U Crusader that set the new national speed record, announced on the final day of the show after CDR R. W. "Duke" Windsor gunned the plane over a 15.1 km course in the dash which broke the 1000 mph mark. The official time was 1015.428 mph, for the Thompson trophy.

A standard production model, the Crusader made the record flight August 21 on the desert course at China Lake, Calif. Propelled by a J-57-P4 engine, Windsor made two passes over the course, being clocked at 1018.553 mph on one run and 1012.303 mph on the return pass. Windsor was in the air for only 32 minutes, but said the Crusader "can break the British speed record" of 1132 mph, which stands as the world mark. He had orders from the defense department to just break the existing record, and "go about 1000 mph."

Before the flight, activities centered on crowding extra pounds of fuel into the F8U's tanks, and the JP-5 was run through a bath of dry ice in a coil. This put the fuel in the plane's tanks at 40 F. The



The advanced new Navy T2V-1 SeeStar jet trainer which flies at 600 mph but lands at only 97 mph.

Crusader's engine was started at the runway's end instead of at the hangar to conserve fuel.

In the famed Bendix race, the top-ranking living jet ace of the Korean war piloted a North American F-100c Super Sabre from California to Oklahoma City for a record speed of 666.661 mph. Capt. Manuel J. Fernandez, Jr., of Miami, Fla., who now lives at Apple Valley, Calif., swept the 1120-mile course in one hour, 40 minutes and 38.8 seconds to win the trophy. The old Bendix mark of 616 mph was set in 1954 by Air Force Capt. Edward W. Kenny in an F-84F Thunderstreak.

Results of other contests included the General Electric trophy race, won by a B-47 stratojet commanded by Maj. Joseph Schreiber, of Brooklyn, who dashed the 1900 miles from Kindley AFB in Bermuda at the record speed of 601.187 mph. The McDonnell trophy was captured by Lieut. (JG) Ralph Carson, who flew 1434 miles in a navy F3h

(*Turn to page* 146, *please*)

CHINA'S

Liberation Model Truck

Goes into Production

CHINA'S first Automobile plant (see AUTOMOTIVE INDUSTRIES, December 1, 1955) has started production. Known as the No. 1 Motor Car Plant, it is located in a suburb of Changchun, Northeast China (Manchuria).

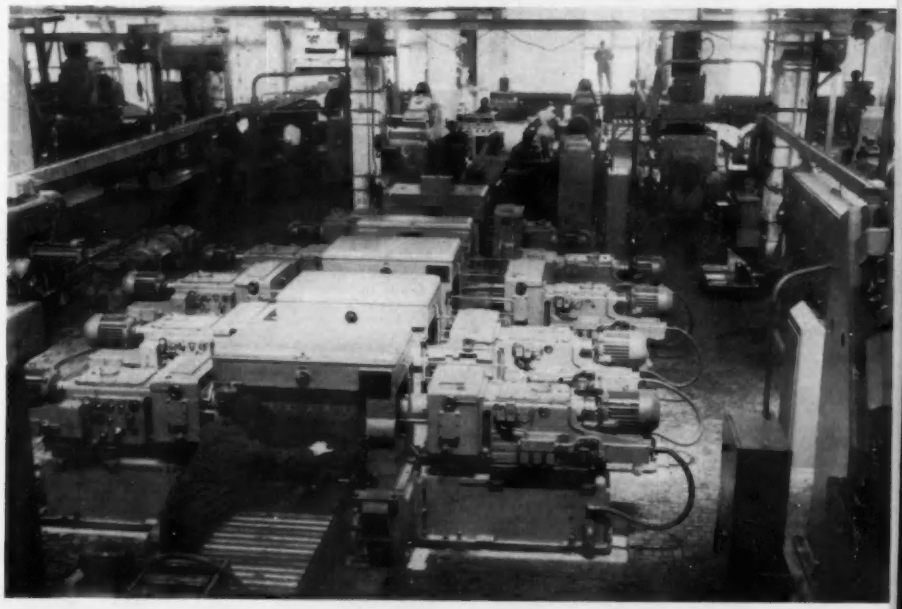
The first 10 trucks came off the assembly line during July. Prior to that, there were trial runs producing vehicles with parts of Soviet manufacture. But the Liberation truck is of all Chinese manufacture. It is a six-wheeler and has a load carrying capacity of four tons. Its six-cylinder gasoline engine develops 90 hp. High spots are shown on these four pages.

Present plans are for mass production of the Liberation to begin this month. Next year it is planned to produce 4000 trucks. When the plant comes into full operation in the early years of China's second five-year plan (1958-62), it will make 30,000 vehicles a year. These will be mainly trucks.

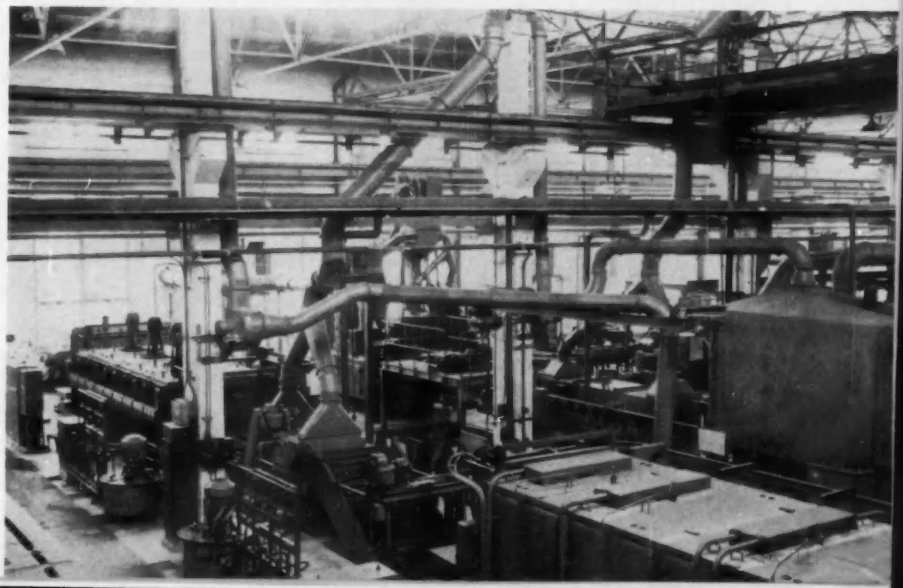
The head of China's State Planning Commission, Li Fu-chun, announced last year that China's automobile industry is to have an ultimate annual capacity of 90,000 vehicles "when all the construction projects started in the first five-year plan period are completed." A No. 2 Car Plant is to have double the capacity of the Changchun plant.

Vertical semi-automatic lathe at left was manufactured in the Soviet Union

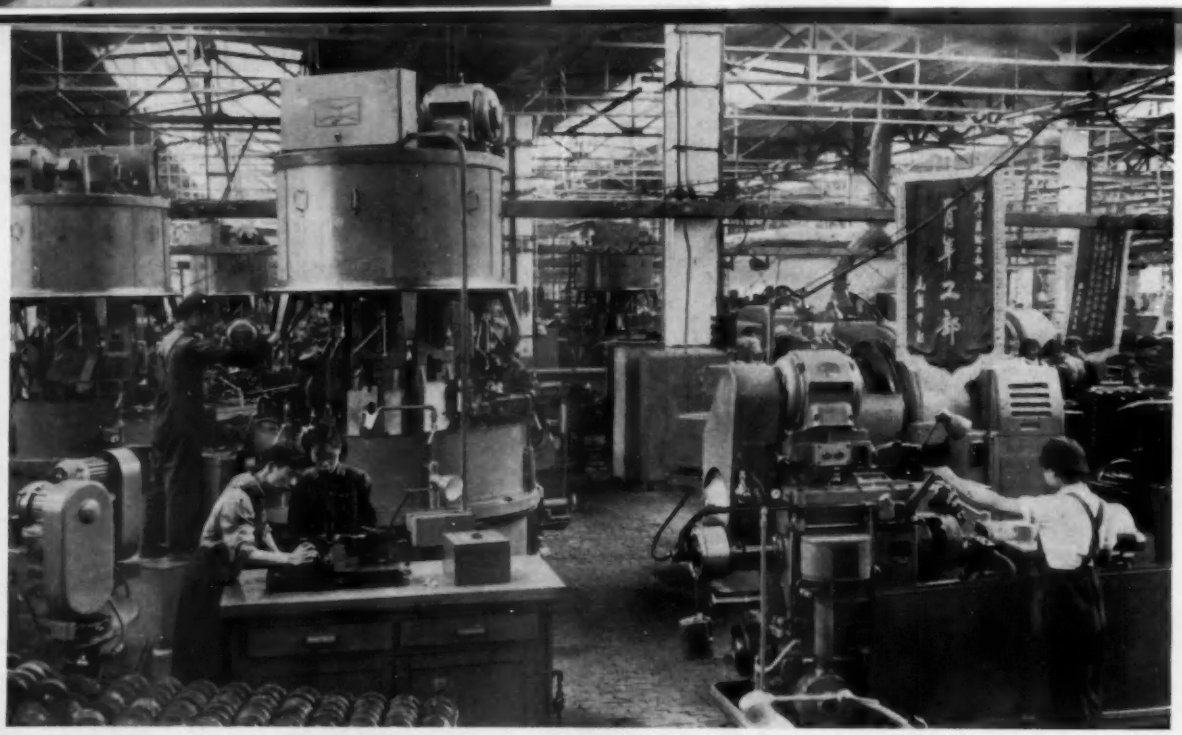
Various types of light and heavy hammers are used in the forge shop



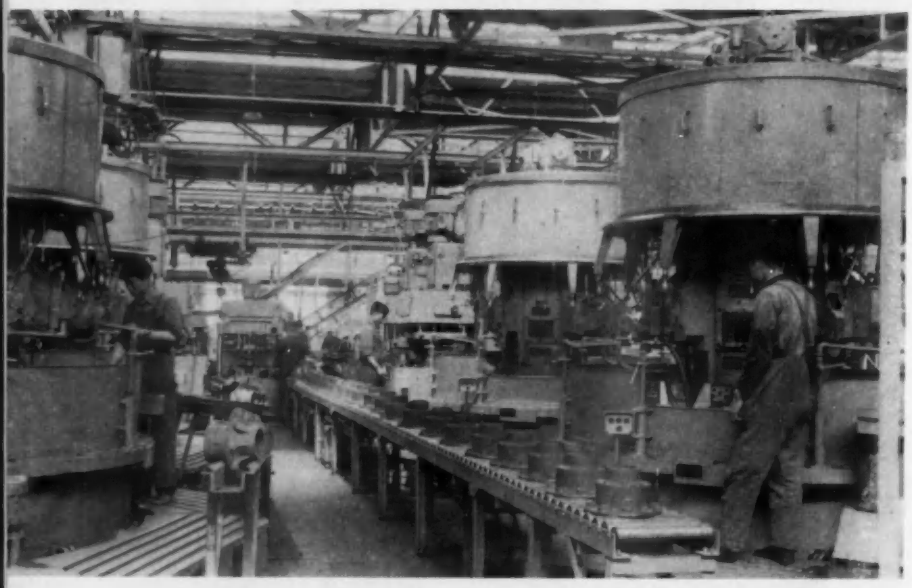
Transfer machine on the cylinder block line. Operations include boring, tapping, etc.



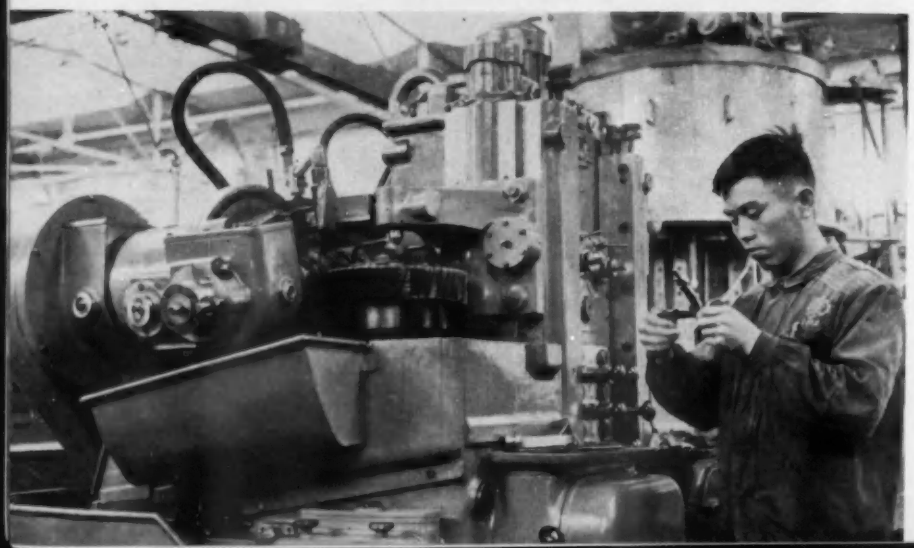
The heat treating department is equipped with electric furnaces



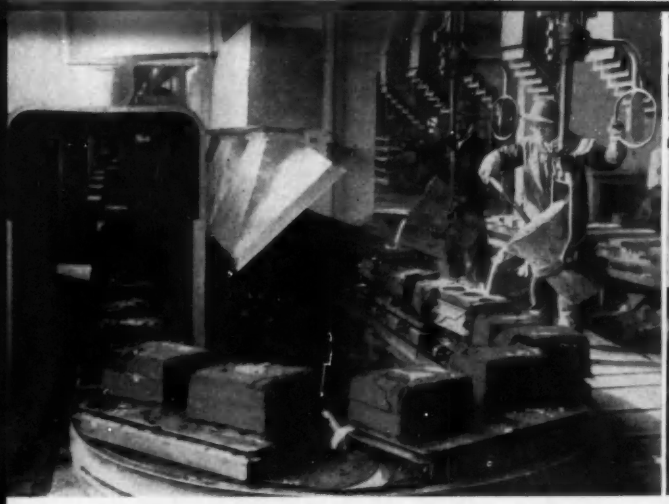
General view of the rear axle gear department



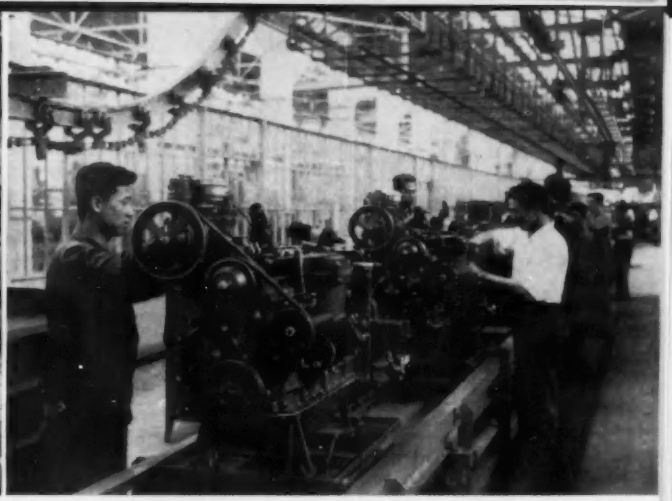
Production lines in the front axle department are equipped with multiple-spindle, vertical semi-automatic lathes and other heavy machines



A double-head gear hobbing machine in the gear department. Average age of workers in this section is 22 years

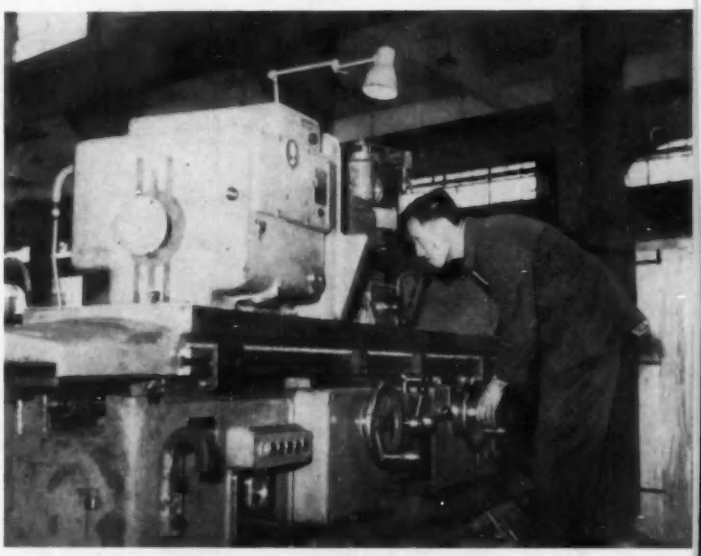


Workers in the foundry stand on a platform which moves with the conveyor



Assembling six-cylinder engines—the first to be built in China

Setup for measuring and checking pistons



Semi-automatic grinder which was manufactured in a Shanghai plant

The Liberation model truck is a four-ton capacity six-wheeler

North American F-100C Super Sabre piloted by Air Force Colonel Horace A. Hanes, holder of the world's first official faster-than-sound speed record

World Airplane Records for SPEED ALTITUDE DISTANCE

By Peter Altman

SOME idea of the future of intercontinental missiles and other high-speed units can be gained, perhaps, by a study of rates of progress in heavier-than-air flight from 1903 to the present. As a part of an overall study of aircraft design trends, the writer had occasion to gather data on world records for speed, altitude and distance, starting with the first official speed record of 25.66 mph, established by A. Santos Dumont in France, in 1906, to the latest official figures for 1955.

By extrapolating the curves included in this article, it may be possible to predict with some degree of accuracy the year in which satellites and even man will be able to fly above the aeropause into true space. The aeropause includes the region between the 10 and 120 mile levels.

The official record for manned aircraft taking off under its own power is 65,889 ft (approximately 12½ miles); a manned rocket-powered aircraft launched from another airplane has reached an altitude of about 16 miles. The German V-2 missile reached a maximum speed of over

TABLE I

WORLD RECORDS: SPEED-ALTITUDE-DISTANCE

From F.A.I. Official Data—1906-1955

Class "C" Airplanes (Land Type)

	MAXIMUM EACH YEAR					
YEAR	Speed MPH	No. of Records	Altitude—Feet	No. of Records	Distance—Miles	No. of Records
1906	25.66	1	.....	.....	.....	.....
7	32.75	1	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....
9	47.84	4	509 to 1,486	3	.....	.....
1910	65.29	3	10,171	12	.....	.....
11	82.73	5	12,828	3	.....	.....
12	108.18	7	18,405	3	.....	.....
13	126.67	3	20,079	2	.....	.....
14	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....
16	.....	.....	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....
19	.....	.....	.....	.....	.....	.....
1920	194.22	7	33,113	1	.....	.....
21	205.22	1	34,508	1	.....	.....
22	222.97	2	.....	.....	.....	.....
23	266.58	4	38,565	2	.....	.....
24	278.48	1	.....	.....	.....	.....
25	.....	.....	.....	.....	1,967.257	1
26	.....	.....	.....	.....	3,352.912	4
27	.....	.....	38,419	1	3,910.932	2
28	.....	.....	.....	.....	4,466.569	1
29	.....	.....	41,795	2	4,911.929	1
1930	.....	.....	43,166	1	.....	.....
31	.....	.....	.....	.....	5,011.349	1
32	294.38	1	43,976	1	.....	.....
33	304.98	1	44,819	1	5,656.932	2
34	314.319	1	47,352	1	.....	.....
35	352.388	1	.....	.....	.....	.....
36	.....	.....	49,944	2	.....	.....
37	379.62	1	53,937	2	6,305.662	1
38	.....	.....	56,046	1	7,158.440	1
39	469.220	2	.....	.....	.....	.....
1940	.....	.....	.....	.....	.....	.....
41	.....	.....	.....	.....	.....	.....
42	.....	.....	.....	.....	.....	.....
43	.....	.....	.....	.....	.....	.....
44	.....	.....	.....	.....	.....	.....
45	606.255	1	.....	.....	7,916.000	1
46	615.779	1	.....	.....	11,235.600	1
47	650.796	3	.....	.....	.....	.....
48	670.981	1	59,445	1	.....	.....
49	.....	.....	.....	.....	.....	.....
1950	.....	.....	.....	.....	.....	.....
51	.....	.....	.....	.....	.....	.....
52	698.505	1	.....	.....	.....	.....
53	755.149	5	63,668	1	.....	.....
54	.....	.....	.....	.....	.....	.....
55	822.268	1	65,889	1	.....	.....
Total	.....	59	.....	42	.....	16

TABLE II

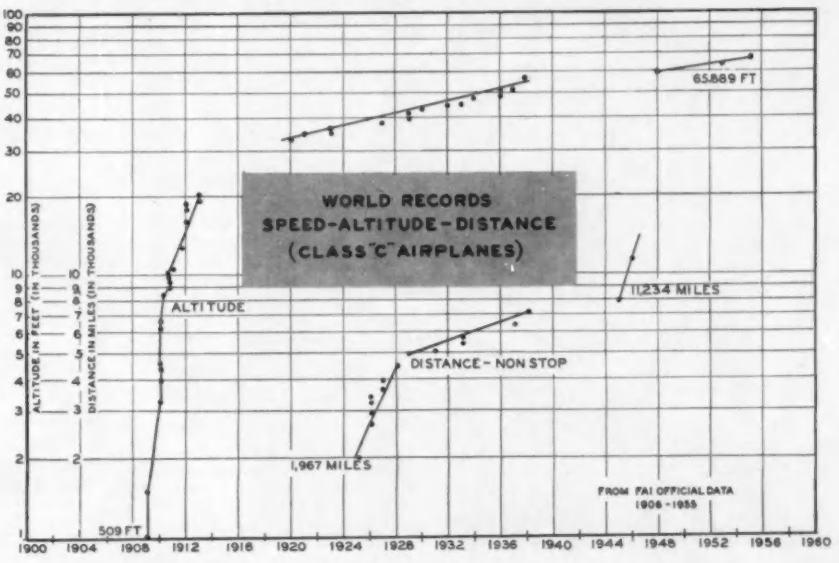
WORLD RECORDS: SPEED-ALTITUDE-DISTANCE

Established by each country

Number of LANDPLANE and SEAPLANE Records

	NUMBER OF RECORDS 1906 TO 1955					
	SPEED		ALTITUDE		DISTANCE	
COUNTRY	Landplane	Seaplane	Landplane	Seaplane	Landplane	Seaplane
England	4	3	6	0	2	1
France	34	0	21	4	7	4
Germany	3	0	1	0	0	1
Italy	0	6	3	1	1	3
U. S. A.	18	2	11	4	5	3
U. S. S. R.	0	0	0	0	1	0
Totals	59	11	42	9	16	12

Chart I ▶



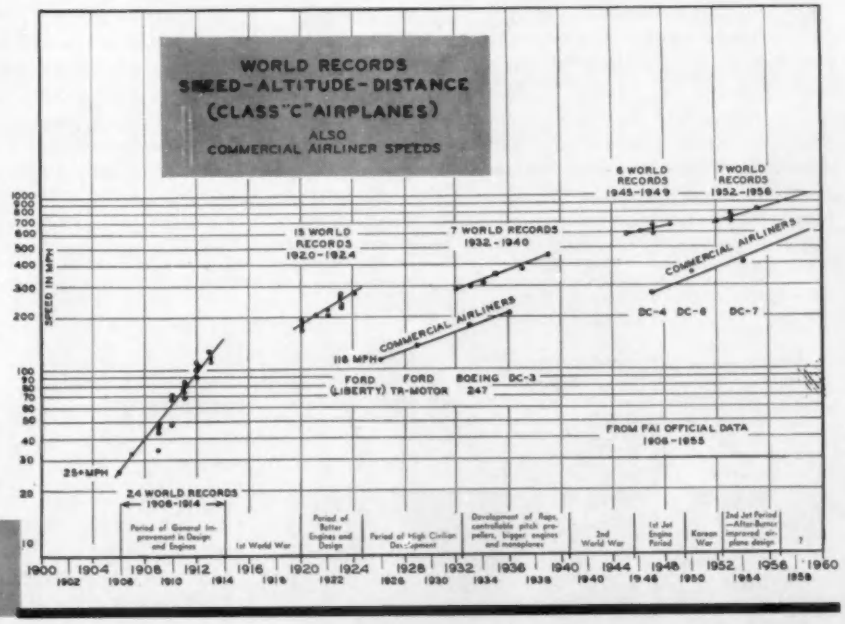


Chart II ▶

3500 mph, an altitude of about 380,000 ft (72 miles) and a distance of about 230 miles. A manned rocket-powered aircraft (Bell X-IA), launched at an altitude of about 35,000 ft from a B-50 bomber, attained a speed of 1653 mph in December, 1953.

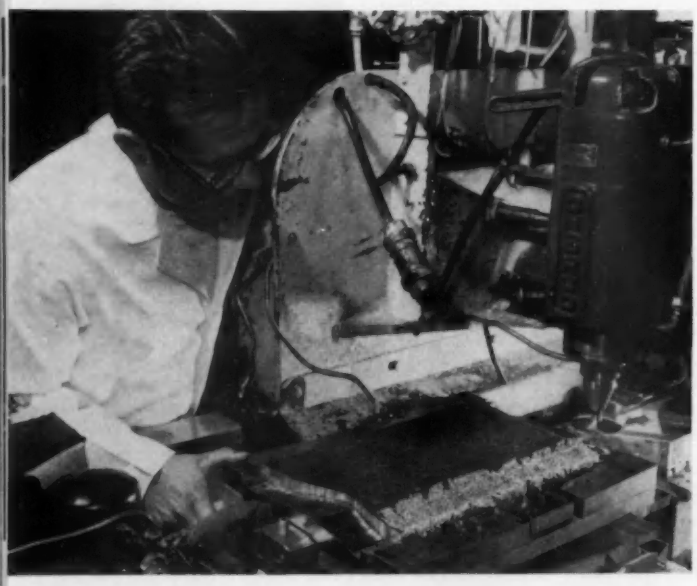
The principle data on world records, which were obtained through the courtesy of the National Aeronautic Association in Washington, are shown graphically in Charts I and II. A summary of these data is given in Tables I and II. It is interesting to note that a total of 59 landplane and 11 seaplane speed records were established from 1906 to 1955; a total of 42 landplane and 9 seaplane altitude records from 1909 to 1955; and 16 landplane and 12 seaplane distance records from 1925 to 1955. In the case of landplanes, France established 34, or 57.6 per cent, of the speed records; 21, or 50 per cent, of the altitude records; and 7, or 43.7 per cent, distance records. For landplanes, the U. S. A. is second with 18 speed records, 11 altitude records, and 5 distance records. The Soviet Union has established no official landplane or seaplane speed or altitude records and only one landplane distance record.

The chart data plotted on semi-log paper show some interesting trends in world records for speed, altitude, and distance for Class "C" airplanes. These records arrange themselves in accordance with the general equation $Y=Ce^{mx}$ in which "Y" is the

(*Turn to page* 106, please)

GENERAL EQUATION

$Y = c\,e^{mx}$
y = Speed MPH
c = Value of y, when x = 0
e = 2.73
m = Slope/.4343 k
k = Scale = 1/13.4
x = No. of years from 1900



Precision milling of metal honeycomb parts is accomplished by the tooling shown at right. Parts are first filled with water and quick frozen by the refrigeration device at left in the illustration. The circular tool at its right slices the material.

Freezing Metal Honeycomb Permits Easier Machining

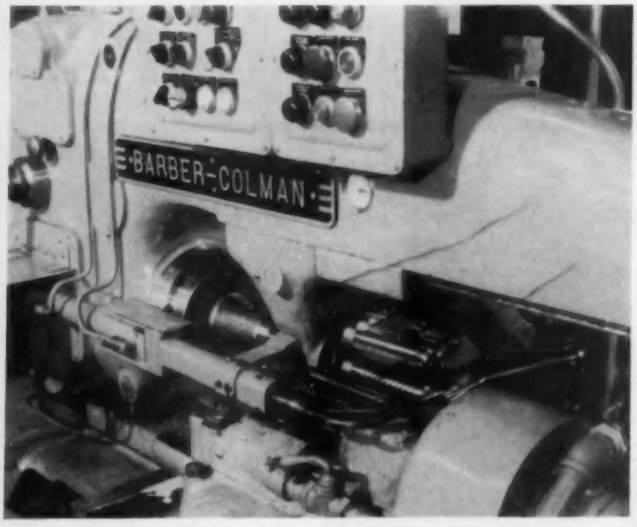
At Northrop Aircraft, Inc., guided missile components made of tissue-thin metal honeycomb are now being produced by a new method illustrated here.

The honeycomb is frozen to make it easier to machine. A refrigeration unit has been coupled to a standard milling machine in one of the company's machine shops. Water is poured into the cells of the honeycomb material. The water freezes within a few minutes, stiffening the material so that it may be machined readily. Previous methods of cutting the honeycomb were balked by the material's tendency to crush under impact of the cutter.

The rotating tool used in cutting the honeycomb is a small, circular slicer. This shears the frozen honeycomb smoothly as it passes over the part. Bevel cuts, slots, and concave or convex shapes may be machined by the new quick-freeze method. The size of the part is limited only by the capacity of the milling machine and the freezing equipment.

• • •

Automatic Loading and Unloading of Hobbing Machine



The first example of the familiar Barber-Colman No. 1415 hydraulic hobbing machine to be equipped with automatic loading and unloading went into operation recently at the Saginaw Steering Gear Div., GMC. Besides being fully automatic in action the setup seen here is also distinctive in the nature of the operation—threadmilling the ball race in the shaft illustrated.

In the operation of the loading device, parts are loaded manually into the vertical magazine at the rear of the machine and feed by gravity into loading position in the foreground. The parts then are loaded into the work holding station by a power cylinder. At the end of the hobbing cycle the part is ejected onto a chute that transfers them to a belt conveyor.

Several safety features have been imposed on the loading arrangement. First of all, the finished part must be fully ejected before the loading cylinder will come into play. In addition, a predetermined number of pieces must be stacked in the magazine before the loading cylinder will transfer a part into position.

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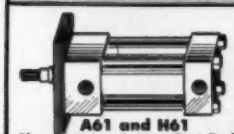
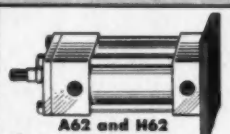
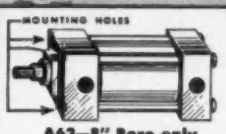
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



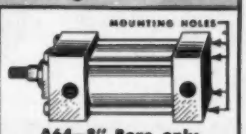
A61 and H61
Flange Mounting on Rod End
(A61 not available in 8" bore)



A62 and H62
Flange Mounting on Cap End
(A62 not available in 8" bore)

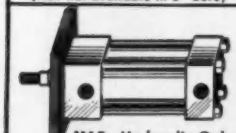


A63—8" Bore only
Flange Mounting on Rod End

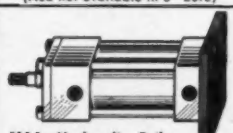


A64—8" Bore only
Flange Mounting on Cap End

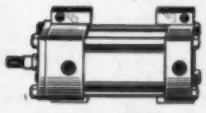
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



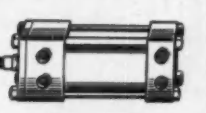
H65—Hydraulic Only
Flange Mounting on Rod End



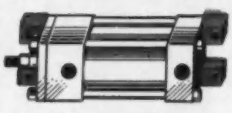
H66—Hydraulic Only
Flange Mounting on Cap End



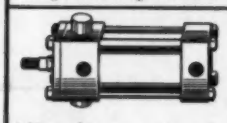
A72 and H72
Side Lug Mounting



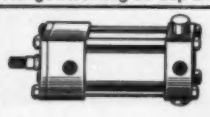
A74 and H74
Side Flush Mounting



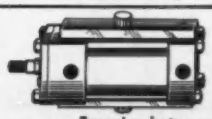
A77 and H77
Side or Foot Mounting



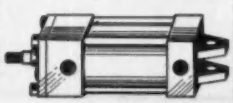
A81 and H81 Trunnion Mounting on Rod End



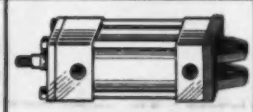
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES In Inches

	Bores	Rod Dia.	Rod Turn Down & Threads	"IN-STOCK" STROKES (in inches)																				
AIR	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12								
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12								
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12									
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36

① "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

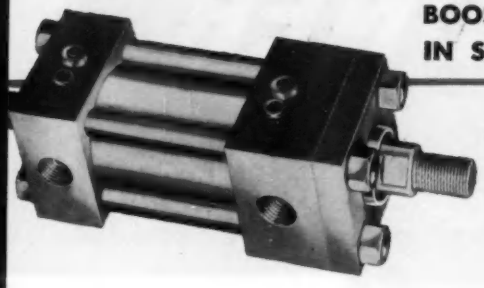
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



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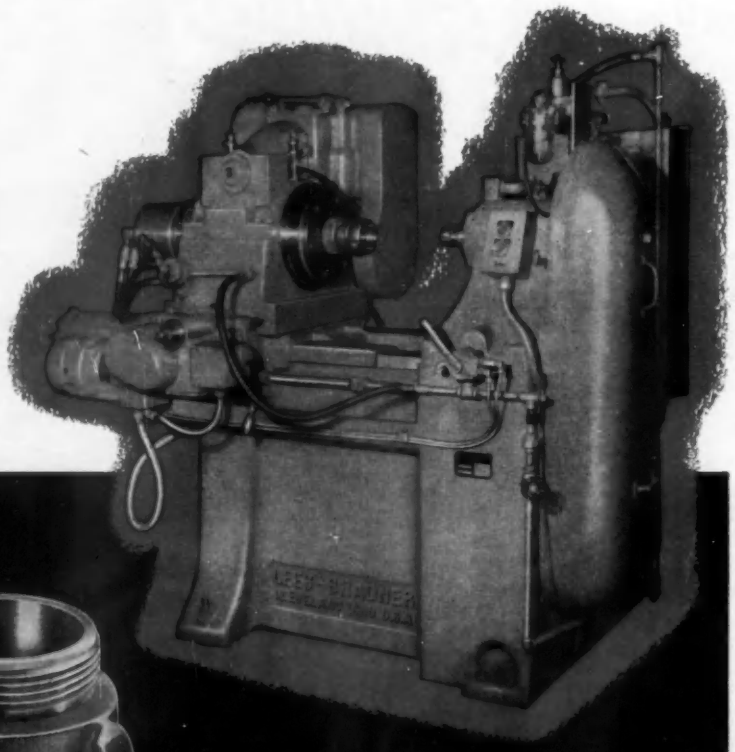

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DETAILS ON THIS JOB

Hob Spindle Speed, 5000 R.P.M.
(Using a high speed cutter spindle)

Thread Pitch
(internal and external) . . . 7½

Thread Diameter . . . . . 3"

Length of Thread . . . . . ¾"

Threading Time . . . . 13 seconds

Material . . . . . Brass

Weight of Parts
Internal thread . . 1 lb. 13 oz.
External thread . . 2 lb. 10 oz.

the LEES-BRADNER Company

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Los Angeles — STanley 7-3148

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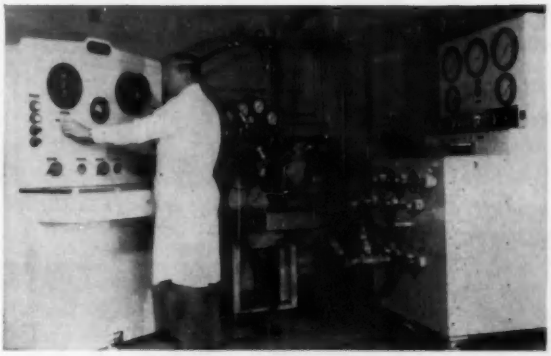
5521 Cleon Ave., North Hollywood, Calif.

This plant is a completely equipped facility for the testing and overhaul of all Pesco products—aircraft and industrial. It is operating under Air Force cognizance and with Navy and Civil Aeronautics Administration approval.



Technician runs dynamometer test on fuel pumps in explosion-proof test cell.

Pesco fuel and hydraulic pumps being overhauled in modern repair department.

For information or service on Pesco products, our western customers are invited to make use of these new facilities.

Engineering Pesco Production

PESCO PRODUCTS DIVISION
BORG-WARNER CORPORATION
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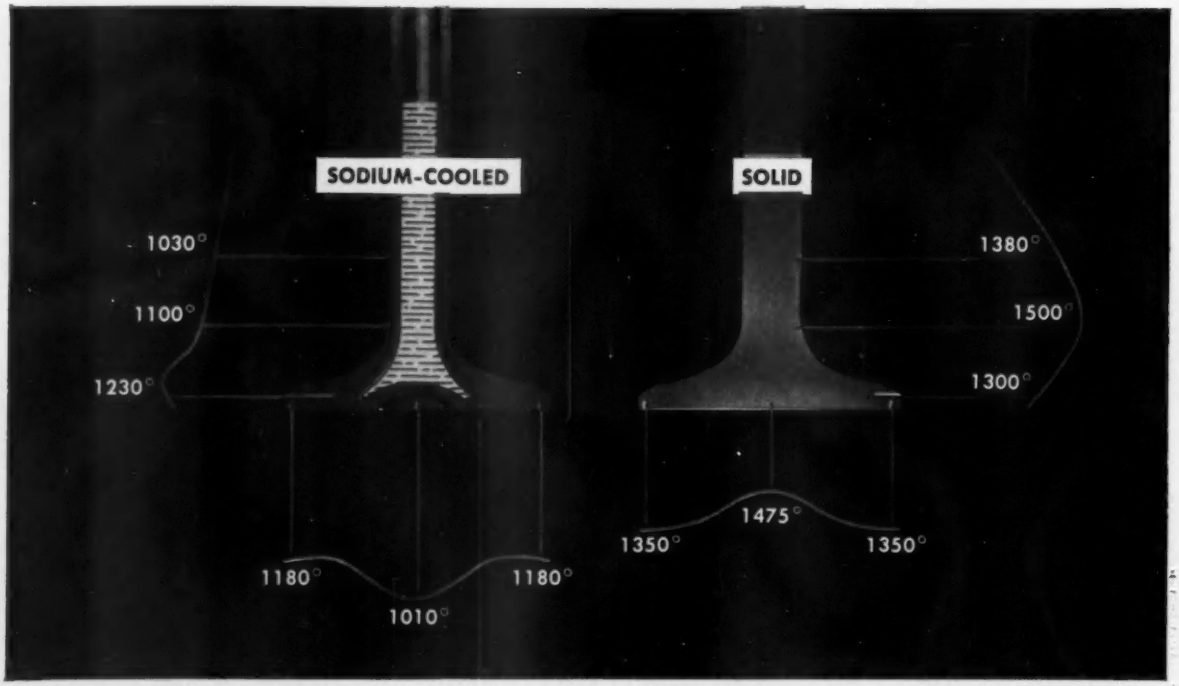
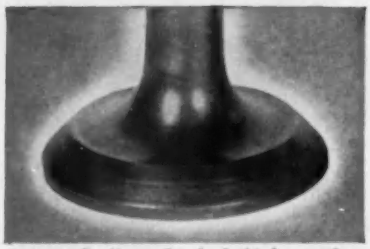
Producing the Best in Hydraulic Pumps, Fuel Pumps, Electric Motors and Axial Flow Blowers

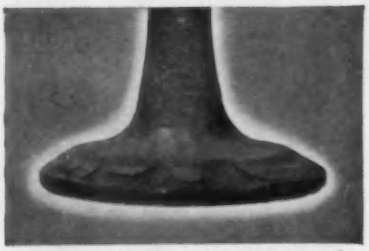
Eaton Sodium-Cooled Valves Run Cooler—



These curves show operating temperatures of Sodium-Cooled and Solid Valves under similar conditions of high output.



Eaton Sodium-Cooled Valve after 110,000 miles—still in good condition.



Conventional valve after 35,000 miles in same type of operation as Sodium-Cooled Valve shown above.

Cooler Valves Last Longer

Today's trend in engine design toward higher speeds and more economical fuel-air ratios results in higher temperatures for many operating parts—including exhaust valves. These higher temperatures sharply reduce valve resistance to corrosion and distortion, definitely limiting valve life. Eaton Sodium-Cooled Valves, operating at considerably lower temperatures, maintain corrosion resistance and strength.

In general, maintenance of Eaton Sodium-Cooled Valves in heavy-duty truck engines is scheduled only at time of major engine overhaul. No in-between trips to the shop are necessary for valve servicing. Engine output is maintained at high levels over long mileages. In many millions of miles of heavy-duty operation, Eaton Sodium-Cooled Valves have proven their ability to keep trucks on the road and out of the shop.

Eaton engineers will be glad to work with you in applying the benefits of Sodium-Cooled Valves to your engines.

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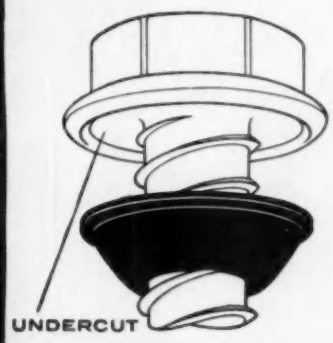
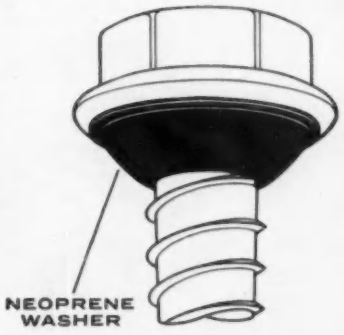
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

For better products

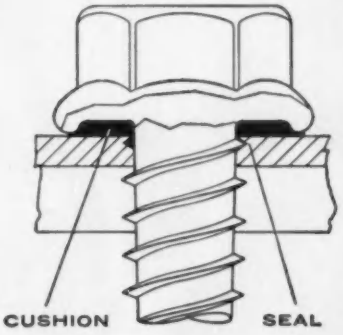
LEAKPROOF...CUSHIONED TUFF-TITE® FASTENERS



Undercut of Tuff-Tite fastener head . . .



. . . confines and controls flow of conical neoprene washer



. . . so washer seals the hole and cushions the fastener head!

Now you can • prevent leaks at fastener holes
• protect fine finishes from fastener damage
• stop vibration noises and squeaks

It's the combination of undercut head design and tough, conically shaped neoprene washer that makes Tuff-Tite fasteners work. The undercut helps confine and control spread of the neoprene washer as it is compressed. The washer's conical shape causes it to flow into top threads and seal the fastener hole.

Tuff-Tite fasteners won't mar fine finishes and they stop vibration noises and squeaks because the neoprene washer spreads itself completely between fastener head and surface. The washer actually cushions the fastener and prevents metal-to-metal contact.

Leakproof, non-marring, shock and squeak absorbing! If you need these fastening advantages, you need National Tuff-Tite fasteners. Write for the Tuff-Tite fastener folder describing this line in detail.

THE NATIONAL SCREW & MFG. COMPANY
CLEVELAND 4, OHIO
Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 South Garfield Ave., Los Angeles 22, Cal.

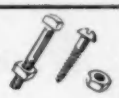
Tuff-Tite fastener facts

Standard National Tuff-Tite fasteners are available in hexagonal, pan, round and truss head styles for screw diameters No. 6 to $\frac{3}{8}$" inclusive . . . maximum over-all length $1\frac{1}{2}$". Standard fastener types are wood screws, self-tapping screws, thread cutting screws, machine screws and stove bolts. Tuff-Tite fasteners are pre-assembled with neoprene washers.

Washers are molded of neoprene which has a durometer hardness of 85 to 95.

Write for information on *special* Tuff-Tite fasteners.

National PRODUCTS

Fasteners  Hodell Chains Chester Hoists

The ring of quality

Colorful, low-cost sidewall rings that can be quickly installed on tires are now contributing to the luxury-look of today's new cars. They're inexpensive, stay brilliant for life, wash bright in seconds, out-last tires. A product of The Bearfoot Sole Co., Wadsworth, Ohio, these rings are available in a variety of colors or in white. They're made of Enjay Butyl Rubber because no other rubber tested could equal its performance in severe laboratory and road tests. The Enjay Butyl label on the Flex-A-Wall® carton assures the buyer of outstanding quality.

Find out for yourself the many technical advantages of Enjay Butyl—the rubber that is outperforming natural and other types of rubber in a wide variety of industrial and consumer applications. For full information, and for technical assistance in the use of Enjay Butyl, write, wire or phone the Enjay Company.

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Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Numerical Type Control for Air Force's Milling Machines Will Increase Production Rate by as Much as 50 Per Cent in Some Applications

Some interesting information on the machining of molybdenum has been gathered by Errol L. Palmer of Fansteel Metallurgical Corp. The following machining tips on molybdenum are extracted from Mr. Palmer's report.

Molybdenum machines with the crumbling chip which is characteristic of hardened SAE 1040 steel. While it is possible to machine molybdenum with high speed steel tools, tungsten carbide tools are recommended.

For inside and outside turning, tools should be ground to standard angles except that a top rake of approximately 30 deg should be used. Speeds up to 100 fpm, with a depth of cut up to ⅛ in. are satisfactory for rough turning. The feed should be 0.015 ipr. For finishing work, speeds to 50 fpm, with a depth of cut of 0.005 in. to 0.015 in. and a feed of 0.005 to 0.010 ipr should be used.

It is very important in turning that the depth of the cut always be greater than 0.005 in. or the cutting tool will wear very rapidly.

If lubricants are not used, tool wear will be excessive and the molybdenum will tear or chip in cutting. For both roughing and finishing cuts it has been found that a mixture of one part chlorothene and four parts of a nonsulphur base cutting oil makes a highly satisfactory lubricant. Chlorothene is similar to carbon tetrachloride, but less toxic. Unmixed cutting oils are not recommended as a lubricant as they shorten tool life and make it difficult to hold close tolerances and fine finishes.

Face milling is quite difficult, but may be accomplished when necessary by the use of carbide tipped cutters and with the lubricants mentioned. The speeds and depth of cut should be similar to those used in lathe turning, except that the depth of cut should not exceed 0.050 in.

Standard ground high speed steel drills should be used for drilling molybdenum. For best results, the drills should be sharpened frequently. It is important to maintain a steady heavy pressure on the drill. The speed should be 30 to 35 fpm, with a feed of at least 0.003 of an inch. A premium grade cutting oil should be used for all drilling, tapping or threading.

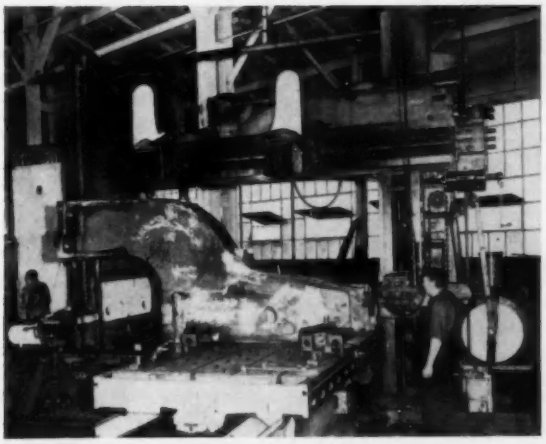
In grinding, molybdenum behaves in a manner comparable to cast iron.

Aluminum oxide wheels of 60 grit can be used if care is exercised, although silicon carbide wheels will do a better job, as they have less tendency to laminate the material. For cylindrical grinding, the work speed should be 250 to 300 fpm, and the depth of grind not more than 0.0002 in.

For best results, molybdenum should always be ground with an excess of coolant. It is important that the coolant be under pressure at the point of contact between the wheel and the work.

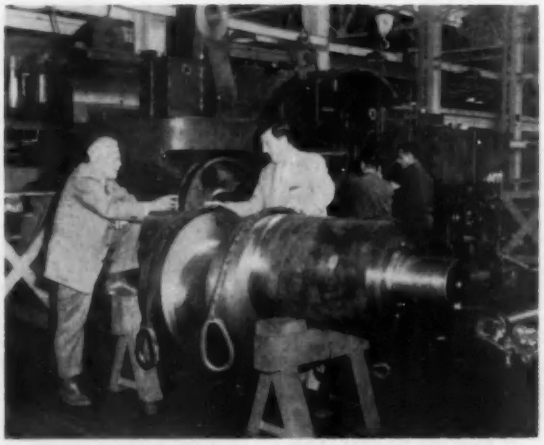
Automating the Skin Mills

Another step toward automation of the Air Force's milling machines was taken recently with announcement by the Air Materiel Command of a change in its contract with the

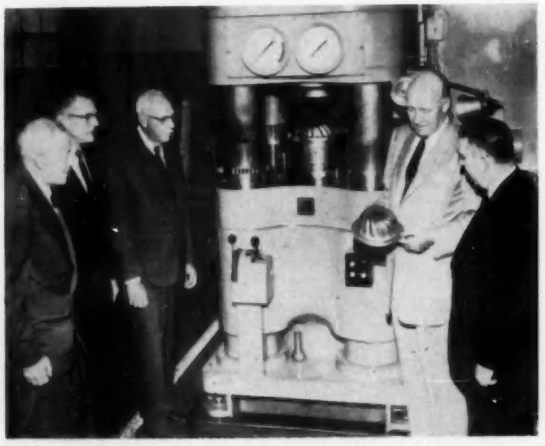


A 5000-lb forging hammer for a large steel fabricator beginning to take shape with the machining of this husky leg in the Chambersburg Engineering Co. plant at Chambersburg, Pa. CECO uses two of these castings as a framework to support the hammer lifting cylinder and hammer guides. The 25-35 carbon-steel castings were manufactured by the Standard Steel Works Div., Baldwin-Lima-Hamilton Corp., Burnham, Pa.

One of the largest broaches of its kind produced by Continental Tool Works Div., Ex-Cell-O Corp., was recently completed for a major manufacturer of heavy earthmoving equipment. A 79-spline involute type, the big broach has a diameter of 8.040 in. and an overall length of 74 in. It will produce splines in a 4.750 in. long steel workpiece in a single pass. The pull end and the follow-rest end are both detachable from the broach shell.



Crankshaft of the new 1¼ in. Boltmaker is flanked by John H. Friedman, chairman of the board, National Machinery Co.—the builder—and Frank G. Kaufman, vice president of Cleveland Cap Screw—the purchaser.



All officers and directors of the Commercial Shearing & Stamping Co., of Youngstown and Chicago, recently visited The Cincinnati Milling Machine Co., Cincinnati, to examine several machines they have purchased. E. D. Vancil, vice president of The Process Machinery Div., Cincinnati Milling, second from right, demonstrates operation of a 12 in. Hydroform Machine to Commercial executives, left to right, Robert Procter, vice president-general manager; Herbert Wollison, vice president Ward Beecher, vice president, and Charles B. Cushwa, Jr. president.

Kearney and Trecker Corp., Milwaukee. The contract change provides for the conversion of 22 milling machines from a template control to a numerical-type control. Fifty-five additional template controlled, contour and profile milling machines now under contract also are to be converted to a configuration using the automatic numerical control system according to the Directorate of Procurement and Production, Wright-Patterson Air Force Base, Ohio. AMC anticipates that the balance of the conversion on these 55 machines will be under contract in the near future.

The Air Force already has under contract a total of 48 skin mills that are automatically controlled. They range in size from 8 ft by 30 ft to 12 ft by 45 ft with the numerical-type control, it is estimated that production is improved by 50 per cent over that now resulting from the use of template controlled machines.

The feasibility of converting the profilers was the result of a study conducted by the Massachusetts Institute of Technology under a contract financed by the Air Materiel Command. The study proved that milling machines, especially profilers, could lend themselves to the automation concept and that the productive capacity would be greatly improved.

The first delivery of the converted machines is expected to be made by Kearney and Trecker to the Air Force about December 1957. These machines will be provided to the various airframe, engine and strut manufacturers in the aeronautical industry.

Sheffield Shows New Gear Grinder

Precision performance of a new gear grinder developed by The Sheffield Corp. was demonstrated in a comprehensive two-day series of evaluation tests conducted at the Dayton plant last month for nearly 100 officials of some of the nation's leading producers of equipment for the Armed Forces, and military and Government engineering and production specialists.

The demonstration, held by Sheffield engineers in cooperation with the Defense Department, put the company's new Model 140 reciprocating gear grinder through an exhaustive series of tests. The showing illustrated the accuracy, speed and versatility of the grinder in production of automatic and other control mechanisms essential to the efficient operation of fire control units, automotive transmissions, machine tool drives, aircraft missile and rocket accessory power units and timing and other devices.

In addition to its simplicity of operation and its extreme accuracy and uniformity in grinding hardened gear teeth, the new Sheffield grinder, it was shown, reduces many preforming and finishing operations formerly necessary in producing precision gears. The demonstration showed how several precision gears may be ground simultaneously and rapidly from solid "blanks" of metal, at rates three times faster than had been found previously possible.

The grinder, developed after nearly seven years of research, is being employed as a long-needed essential tool in the production of such precision gears as those used in airborne radar controls. These gears, it was explained by Sheffield engineers, must be turned out in volume to accepted "precision" tolerances.

In addition to the gear grinder demonstrations, the visitors also were escorted on a tour of Sheffield's new Eli Whitney Metrology Laboratory, said to be the world's newest and most complete private facility devoted entirely to helping industry research to solve all types of gaging and dimensional measurement problems in modern manufacturing.

American Bosch Sales Way Up Over Last Year

Net sales of American Bosch Arma Corp. amounted to $55,497,863, an increase of 39 per cent, during the first half of 1956. This compares with $39,798,967 for the same period of 1955.

The business volume resulted in consolidated net income, after taxes, of $2,228,281, including special credits for prior years' taxes in the amount of $214,070. Earnings for the same period last year were $2,367,282, but included a special credit of $909,265.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Thickness Measurer

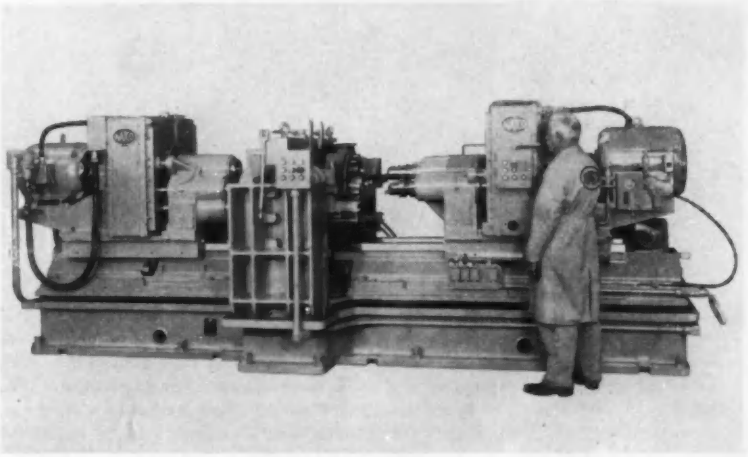
WITH improvements and added features for greater accuracy and easier use, a completely new ultrasonic thickness measuring instrument called the SO-100 Sonizon has been introduced. It is an instrument which measures thickness from one side and shows readings by a pip on a TV type tube face when the crystal probe is touched to the test surface. By means of thickness determination the unit can detect thin spots in walls of cast, formed, welded or ground objects; laminar defects and laminations; eccentricity in cored castings; and lack of bond between materials, as in bearings, brake shoes, and sandwich constructions.

Features cited which add to its usefulness include small size, light weight (30 lb), and a long search cable which make it adapted for use in constricted areas. The three-inch presentation tube has a bright and clear trace. Light shields are not needed, even in outdoor work. Greater accuracy, plus or minus one per cent, is also said to be attainable. Circuits for completely automatic operation have been built into the new instrument. This circuit is used to impose predetermined tolerance limits on the instrument so that it will automatically actuate "go —no go" equipment on alarms, depending upon the measurement in each case.

Another feature reported is the ease with which thicknesses beyond the normal direct reading range (0.500 in.) are measured. A special clipper circuit eliminates hash or noise, equalizes the size of pips, and narrows the pip base to a straight line, resulting in accuracy when reading multiple harmonic pips. A simple harmonic calculator is included with the unit, for making measurements rapidly, up to four inches, without calculations. Or, an accessory harmonic comparator can be used to make this an even faster process. With the comparator the direct reading range of the unit is increased by 10 times, to 5.0 in. *Magnaflux Corp.*

Circle 30 on postcard for more data

Two-Way Horizontal Boring Machine



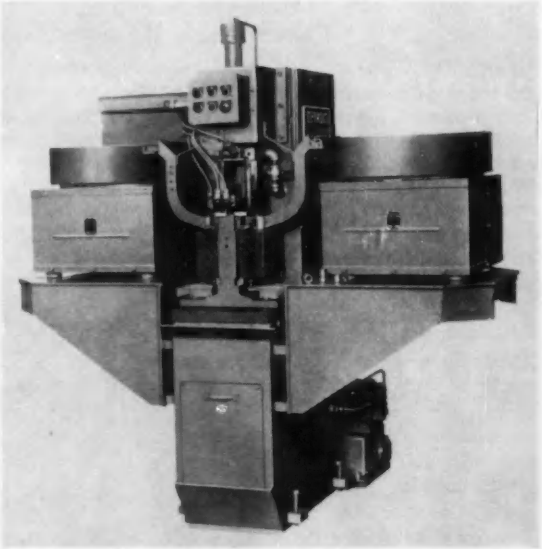
The automatic boring machine pictured handles five different transmission housings at a production rate up to 35 parts per hour, maintaining close tolerances. Specified tolerance on the idler bore diameter is 0.0005-in.; and the bore has to be square with the mounting face within 0.0005-in. per inch of bore length. The machine, employing hydraulic feed, has a fixture designed for holding the five different housings. In addition to close-tolerance boring, the machine chamfers, counterbores and notches boss contours. (National Automatic Tool Co., Inc.)

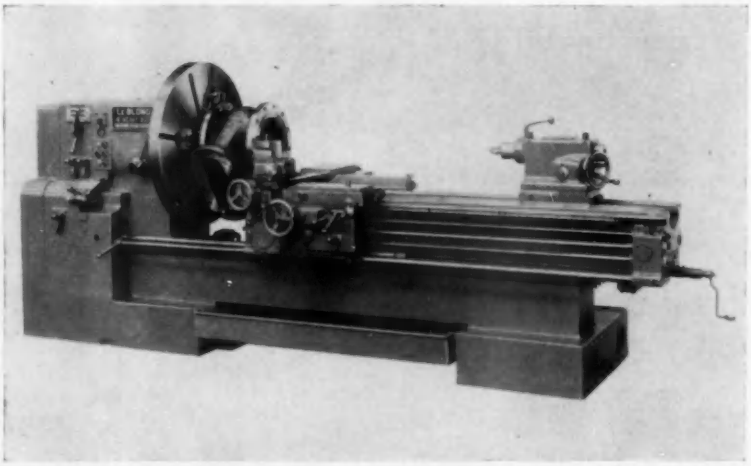
Circle 31 on postcard for more data

Automatic Hydraulic Broaching Press

This machine broaches a radius groove in both ends of two different length pinion gear blanks at the rate of 2080 pieces per hour. Operation is fully automatic. The blanks are loaded into hoppers on each side of the machine, positioned and loaded into feed magazines by vibration, pushed through stationary broaches by twin pushers attached to the hydraulic press ram, and unloaded automatically into ejection chutes. Hopper loading can be done automatically, and the machine will stop if the hoppers are empty. (Detroit Broach & Machine Co.)

Circle 32 on postcard for more data





LeBlond 16-in. lathe has a sliding bed which can be extended for added capacity

Sliding Bed on Lathe Gives Versatility

WITH sliding bed extended, a new 16-in. sliding bed gap lathe gives twice normal swing size, more than 50 per cent greater distance between centers. With bed closed, it functions as a regular engine lathe. The lathe handles large diameter work, long pieces and parts with large projections.

The basic difference in the unit is its special bed which slides open to form a gap and enables the lathe to change shape to suit odd-shaped parts. For example, the manufacturer reports the following unusual capacities can be turned on the 16-in. lathe: Face 38 in. diameters in one cut. Face 45 in. diameters in two cuts. Turn lengths more than 50 per cent greater than normal center distance. With extension rest (optional): turn 27½ in. diam, 13¼ in. length. With full-swing turning attachment (optional): turn 45 in. diam almost full length of gap.

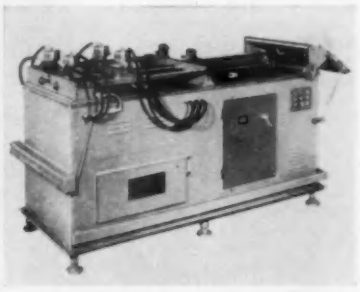
Other features of the lathe include new spindle bearing design for high-speed turning, combination gear-belt drive headstock, 18 geared speeds and 9 timing belt-driven speeds from 8 to 2000 rpm, four-way rapid traverse, totally enclosed quick change box, hardened and ground steel bedways, and thrust-lock tailstock. *R. K. LeBlond Machine Tool Co.*

Circle 33 on postcard for more data

Punch Press Gripper Feed

RECENTLY announced was a heavy-duty punch press gripper feed which handles stock 32-in. wide, 0.250-in. thick and offers a maximum stroke length of 32-in. Designated No. FC-3232, it is a hydraulically-operated unit equipped with a feed cylinder of 2½-in bore and 32-in. stroke infinitely adjustable from 32-in. to 0. At a pressure of 500 psi in the hydraulic system, a force of 2400 lb pulls the stock through the feed while the gripping pressure on the stock is approximately 12,000 lb. These pressures can be increased or decreased by changing the pump pressure within the limitations imposed by the motor.

The timing of the feed with the press is accomplished by means of a limit switch mounted on the press in such a manner that when the ram goes up the limit switch makes contact and energizes the solenoid of a four-way valve. This causes the gripper heads of the feed to grip the stock and move forward on their feed stroke. When the limit switch breaks contact, the gripper heads release the stock and return to the back position.



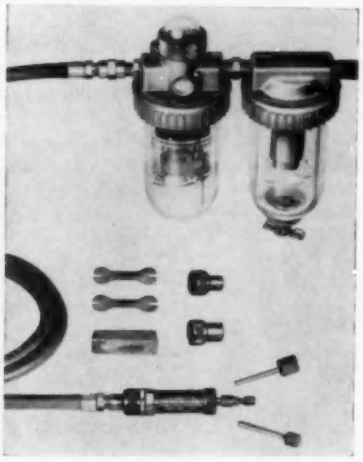
Ses-Matic punch press gripper feed

A pair of hydraulic-operated stock retainers are mounted at the press end of the feed. They hold the stock with a force of approximately 12,000 lbs. while the grippers move back for the next stroke. Provision is made in the electrical control panel for cutting out the hydraulic retainers whenever desired. Mechanical stock retainers are also incorporated in the feed, and are mounted ahead of the grippers. *Special Engineering Service, Inc.*

Circle 34 on postcard for more data

Miniature Grinder

FOR precision, detailed grinding in tool rooms and on production work, a new high-speed, vane-type grinder is now being offered. Called the Mini-Grinder, it is only 3¾ in. long and weighs only 3½ oz. Rated capacity is ½ in. mounted point or grinding wheel. The tool has a ⅛ in. precision-ground collet. A rotary valve in the tool provides infinite speed control from 0 to 50,000 rpm.



Buckeye high-speed Mini-Grinder

This miniature grinder is available in a complete kit, which includes grinder, three nose pieces, three mounted points, two collet wrenches, dressing stone, five feet of air hose and couplings, and a fog-type filter-lubricator. The tool is also available as a separate unit. *Buckeye Tools Corp.*

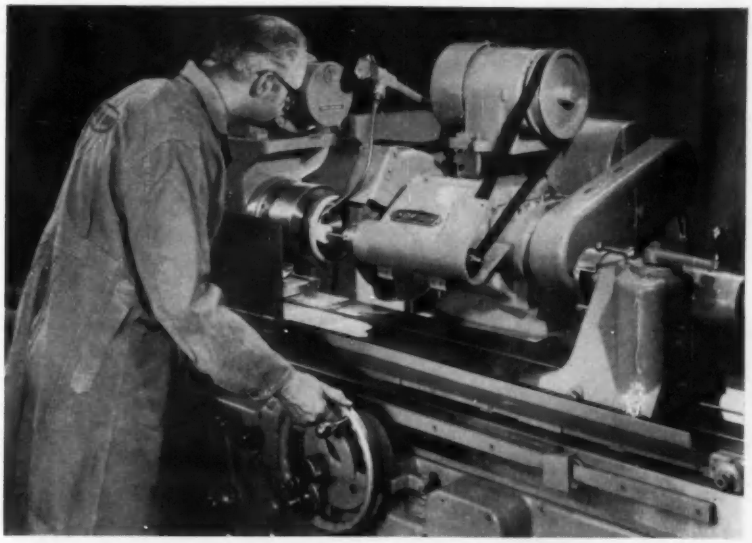
Circle 35 on postcard for more data

Air Hammer

INTRODUCTION has been made of a new model heavy-duty air hammer known as the AD 500. Designed for a wide variety of industrial and automotive applications, it has a bigger hammer and a bigger piston to deliver more force. Though it delivers 2200 blows per minute at less than 80 psi, it weighs under four pounds and is extremely maneuverable. A patented safety chuck locks the various tools used with the hammer in six different positions.

According to the manufacturer, the model AD 500 can do heavy cutting, chipping, chiseling or grooving, yet is so light in weight and easy to handle that it keeps operator fatigue at a minimum. *Superior Pneumatic & Manufacturing Co.*

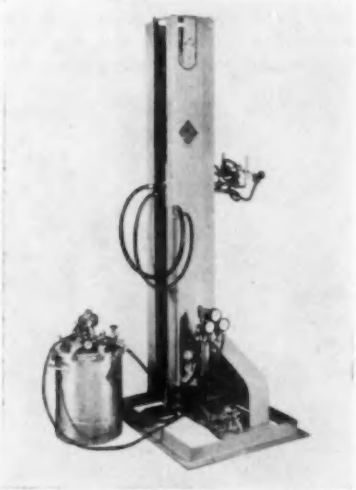
Circle 36 on postcard for more data



Internal grinding setup on the Norton 14-in. Type U-4 universal grinder.

Painting Oscillator

A VERTICAL oscillator recently built permits the automatic spraying of panels, boards, strips or other flat pieces carried on overhead conveyors. Automatic spray guns are carried up and down on a ball-bearing carriage and are controlled by adjustable, cam-operated valves to cut off spray at the end of each stroke. The explosion-proof motor with variable speed drive is adjustable to synchronize with conveyor speeds. The unit is supported on a heavy steel frame with provision for permanent installation. *Paasche Airbrush Co.*



Paasche vertical oscillator

Circle 37 on postcard for more data

Universal Grinders Feature High Efficiency

TWO new universal grinding machines are said to have features which permit fast setups and rapid action in performing external, internal and angular grinding operations on large workpieces. Called Type U-4, they are 14-in. and 18-in. machines.

In changeovers involving chucking, internal, or dead center grinding, setup is stated to be particularly fast because of simplified procedure. A chuck can be permanently mounted on the U-4. A 6-in. D-1 cam lock nose on one end of the headstock takes chucks or special fixtures, and the other end is equipped with a dog drive plate for conventional grinding on centers. The change from conventional to chucking grinding only requires swiveling the headstock 180 deg and chucking the workpiece.

The permanent chuck mounting combines with the hinged-bracket type internal grinding spindle to speed setups for internal grinding. The individually-powered internal spindle is quickly swung down into grinding position—or is easily swung back to the inoperative position. An internal and external grind on a workpiece can thus be done without disturbing the setup.

An infinitely adjustable work speed of 60 to 360 rpm, produced by mechanical means from an a-c source, is available. Speed changes are made by a small handwheel on the headstock.

Additional versatility is obtained in the wheelhead which has a double swivel, one above and one below the slide ways. This feature permits independent angular settings of grinding wheel position and grinding wheel feed, thus making it possible to set the wheel at any angle and to feed at any angle.

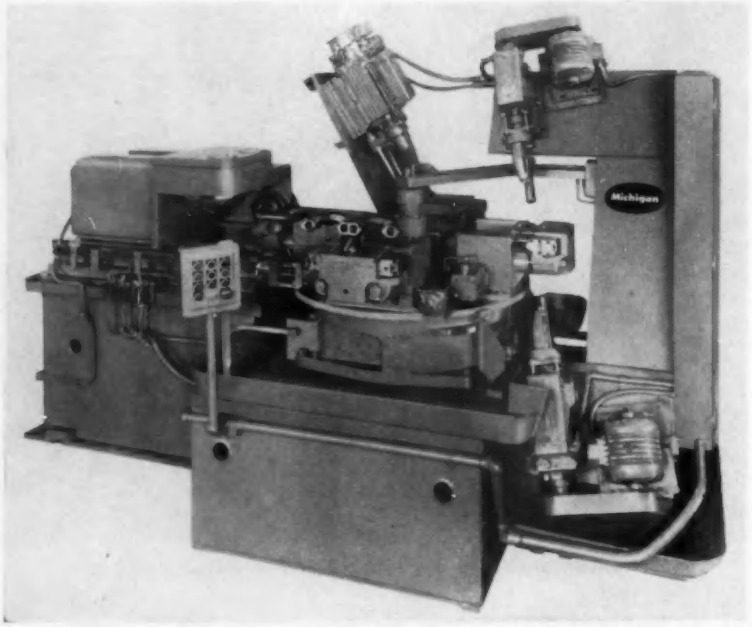
An automatic grinding cycle arrangement and a power wheelhead positioning mechanism are available at extra cost. The Swivalign dual electric indicator can be furnished with these machines for taper setting and for maintaining swivel table alignment. *Norton Co.*

Circle 38 on postcard for more data

Fast-Response Circuit

THE development of a new fast-response circuit for a line of automatic machine tools and plastic molding presses which utilize the Westinghouse Cypak system of machine control, was recently revealed. The Cypak control system has no moving parts to wear, jam or otherwise cause trouble, and accordingly is extremely reliable and requires little or no maintenance, it is said. Now any of the company's automatic machine tools or plastic molding presses is available with a Cypak system, and the company-designed circuit will be included. It is described as a fast-response circuit, highly versatile and adaptable to conditions. *Baker Brothers, Inc.*

Circle 39 on postcard for more data

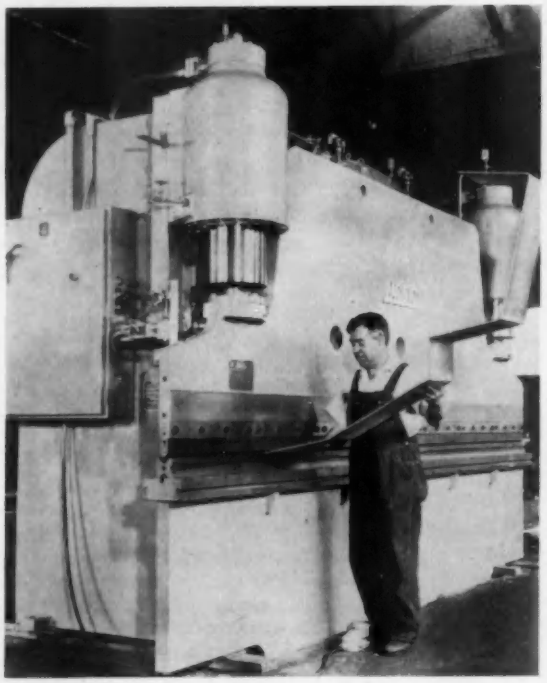


Machine for Processing Exhaust Manifolds

Called "Angle-Matic," this machine was designed to mill the locating pads, and drill and ream the heat tube holes in a V-8 exhaust manifold. Every operation is angular, except the milling of the locating pads. It is a five-way angular and horizontal dial type machine, featuring a four-station automatic index table and power clamping fixtures. At 100 per cent efficiency it will process 120 manifolds per hour. (Michigan Drill Head Co.)

Circle 40 on postcard for more data

Hydraulic Press Brake Produces Multi-Angles



This hydraulic press brake forms up to seven different angles in succession without resetting the controls. All bends on a piece are formed in one handling by one pre-setting of controls. Range is from 12-in. deep bends formed in a single stroke to bends of less than 1/8-in. with press cycling at 50 strokes per minute or more. Work may be done at any point along the entire length of bed. The piece can be passed progressively from die to die for blanking, deep drawing, embossing, punching and forming. The machine is also usable for straightening, rubber pad forming, stretching, extruding, hot forming, and shearing heavy plates. (Pacific Industrial Manufacturing Co.)

Circle 41 on postcard for more data

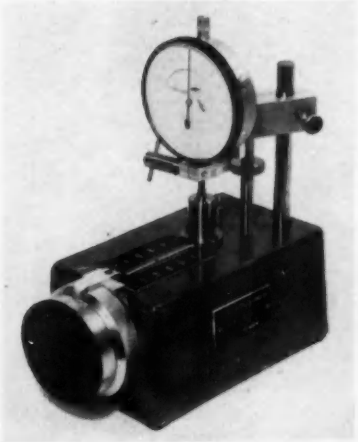
Inspection Marker

USABLE for permanently reproducing inspectors' symbols, codes, O.K.'s, rejects and designs on machined, glazed or polished surfaces, a new portable unit called the "Airgrit" marks delicate precision or thin-walled parts without danger of fracture or distortion. It leaves an "etched" impression on the surface of the part by blowing fine abrasive grit through the relieved portions of a rubber mask. Made to customer requirements, masks can be interchanged in a few seconds for different markings by snap-fitting them over the nose of the unit's gun. Both the depth of marking (settings can be made for marking depth as little as 0.001-in.) and the marking time cycle are controlled. Slight finger pressure on the operating button, conveniently located on the holding handle of the gun, actuates the complete marking cycle. *Jas. H. Matthews & Co.*

Circle 42 on postcard for more data

Dial Indicator Calibrator

NOW being offered is a new calibrator for checking and calibrating the accuracy of dial indicators. In operation, the principle involved is a plunger driven by a hardened wedge and a precision screw. The screw is operated by two dials. The outboard dial, for fine control, is graduated in 0.000025-in. The inboard dial, for rapid travel, is knurled and drives the



Custom dial indicator calibrator

screw through a set of planetary gears. The range is 0 to ½-in. travel of CW or CCW indicators. *Custom Scientific Instruments, Inc.*

Circle 43 on postcard for more data

Tool Inspection

As a positive method for detecting cracks and other imperfections in new and reground carbide tools, surface conditioning with liquid honing equipment is being proposed. Liquid honing uses abrasive and hydraulic action to force fine sintered material out of minute cracks or fissures, which then become obvious defects during visual inspection. Because of heat and pressure in grinding, such fissures are normally sealed and hidden by the sintered material, and may not always appear during inspection by other methods.

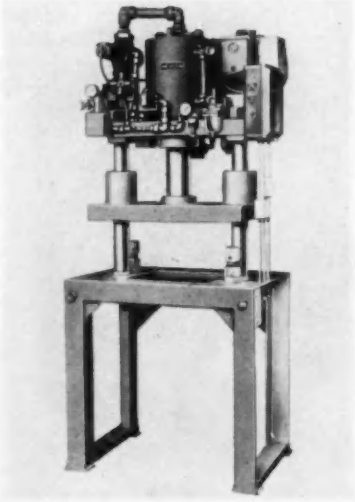
Liquid honing removes burrs and grind lines, and is said to produce a satin matte finish without dimensional change. Inspection processing can be done at the rate of more than 100 single-point tools per hour.

Other uses for standard liquid machines include such toolroom and production-line operations as surface finishing, cleaning, descaling and deburring. *Vapor Blast Mfg. Co.*

Circle 44 on postcard for more data

Hydraulic Trim Press

A HIGH-SPEED 20-ton hydraulic trim press developed primarily for the die casting industry but also applicable to other high-production applications, was introduced recently. It

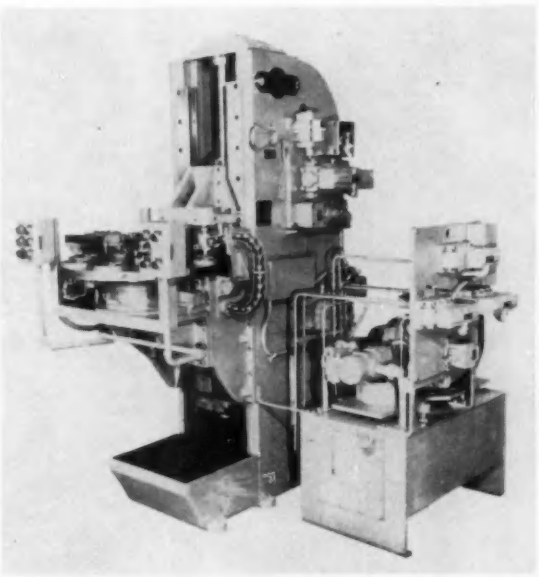


Mohler 20-ton hydraulic trim press

is said to incorporate a number of features which represent a new concept in operation and performance. One of the stated features is that the press is operated by a three-horsepower motor whereas presses of similar capacity have usually required 7½ hp or more to accomplish the same end results. Also featured are high-speed travel of ram in both directions, and "shock-free" operation. Because of the accuracy in the relation between the ram and platen travel, die life and production rate are said to be increased.

The press operates at speeds in excess of 600 ipm free ram travel; at reduced speeds during trimming, shearing, forming and drawing operations. Speeds from 0 to 600 ipm are obtained through the use of vernier controls. The stroke is adjustable from 0 to 12 in., with a shut height of 17 in. between platens. The upper platen has an 18 by 24-in. free area. The lower platen has a 15 by 15-in. cut-out which can be eliminated or varied to suit requirements. The working area between the uprights is 23 in. Additional controls are available for selecting ram speeds of 0 to 40 ipm during pressing operations. Upclosing rams are also obtainable for double pressing action or when ejection operations are required. Presses from 10 to 1000 tons are available. *The Mohler Engineering Co.*

Circle 46 on postcard for more data



American type T-6-24 vertical push - down broaching machine assembles and burnishes completed parts at a production rate of 400 pieces per hour

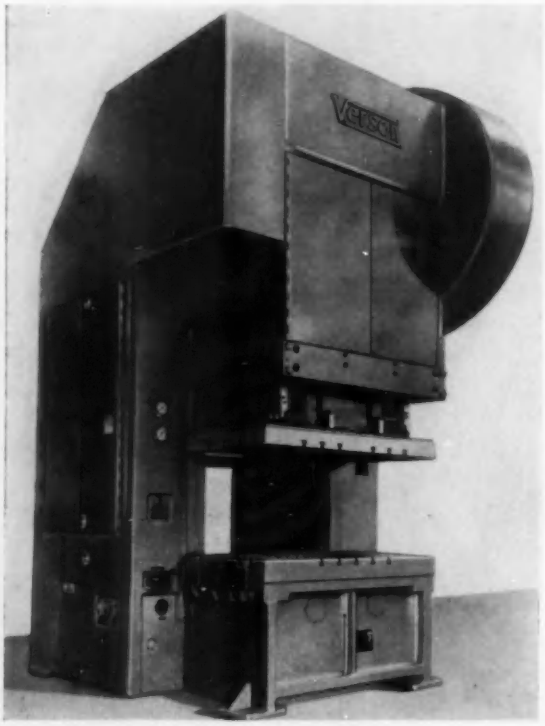
Vertical Push-Down Broaching Machine

THE new six-ton, 24-in. stroke vertical push-down broaching machine illustrated has been tooled to assemble bushings into cover parts and burnish in a continuous operation. With a six-second cycle, and based on 100 per cent efficiency, 400 parts per hour can be produced. This machine is said to represent an excellent example of the adaptability of the company's Type-T three-way broaching machines to push, pull, or surface broaching applications.

The T-6-24 shown is electrically-controlled and hydraulically-operated from a self-contained pump and tank unit. Tooling consists of a two-station push head, special dial-type index unit for carrying the cover parts through separate operations, magazine and transfer slide for feeding bushings, and magazine and return for burnish balls.

The machine cycles as follows: Cover parts are loaded, either automatically or manually, at front of table; table indexes clockwise to assembly station where bushings are fed onto the part; machine ram moves down to press fit bushing into the cover part and returns to position; table indexes the completed assembly to burnishing position; and burnishing ball is forced through bushing simultaneously with new assembly operation at the first station. *American Broach & Machine Co.*

Circle 45 on postcard for more data



Verson gap press, of completely - enclosed streamlined design, contains a completely automatic lubrication system with all gears enclosed and running in oil. A central lifting hook on the press simplifies setting and moving the press. It is possible to have the press moved from position to position for convenient location set-ups on special work

Gap Press Offers Safety, Convenience Features

INCORPORATING safety and convenience provisions for protecting both operator and press, a new gap press features fully-enclosed gears, flywheel, clutch and all other moving parts. In addition, piping and wiring of all air, lubrication and electrical components are totally enclosed, in the press.

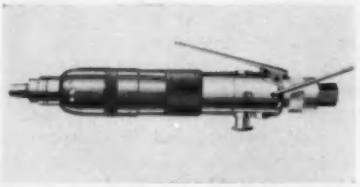
Die space area of the press is well-lighted for working convenience and there are receptacles and pockets for safety blocks to prevent the press from operating while men are working in danger areas. Service outlets of 440 and 110-v provide power for portable electric service tools; and a self-contained air supply system provides air-powered service outlets. Exact position of the ram at any point in the stroke is shown by an electric indicator. The complete electrical control system includes extra outlets and cams for tying press into automation lines and for automatically operating ejector type dies. *Verson Allsteel Press Co.*

Circle 47 on postcard for more data

Air Screwdriver

FEATURING a quiet exhaust, the "Dulcetone" air-powered screwdriver is said to run with reduced noise level, lessening operator fatigue in assembly operations. The new exhaust system adds neither excess weight nor bulk, and permits the tool to operate at full rated speed and power, according to the announcement. The tool is powered by the company's standard 000 series motor of light-weight, high-speed design.

Models 7500-B and 7501-B can be reversed instantly in operation, without the need of releasing lever throttle. Operator merely pushes button for reverse rotation, releases for forward rotation, and uses only one hand. Button can be locked for reverse rotation if desired. Adjustable-clutch models can be pre-set to correct torque requirements. Clutch jaws automatically disengage when screw is set to desired tension. The tool can be easily converted to a nutsetter.



Aro Dulcetone air-powered screwdriver

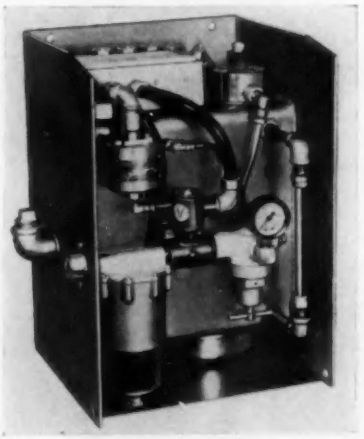
Dulcetone screwdrivers have a nominal capacity of No. 8 free running nuts and machine screws. Speed is 1800 rpm. *Aro Equipment Corp.*

Circle 48 on postcard for more data

Machine Lubricators

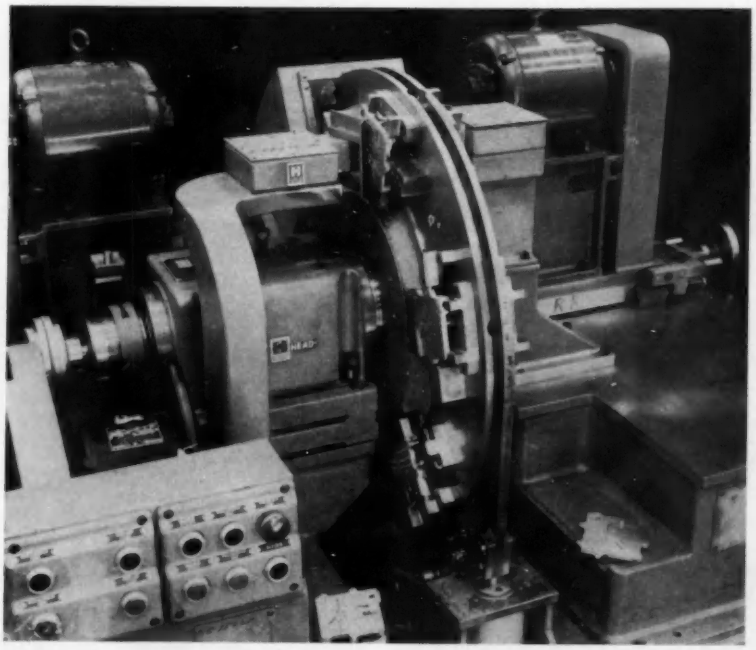
TWO new oil-mist lubricators are designed to provide automatic continuous lubrication for up to 300 or 500 bearing inches (one bearing inch equals one inch of shaft diam) of lubricated mechanisms while consuming one-tenth as much oil, according to a recent announcement. They are said to operate efficiently whether in a compact installation or extended over a distance of 400 ft, with automatic control of all operating conditions. Built-in safety switches respond instantly to the requirements.

The systems use compressed air to atomize oil into mist, which is then distributed through tubing to mechanisms such as anti-friction bearings, plain bearings, gears, slides, ways, chains, cams and rollers. They are operated automatically from the machine's "on-off" switch, have no moving parts, and only require filling of the oil reservoir, eliminating the human element from lubrication work. The flow of air through the bearings is also said to act as a coolant and to lock out dirt. *Alemite Div., Stewart-Warner Corp.*



Alemite oil-mist lubricator

Circle 49 on postcard for more data



Heald Bore-Matic precision-faces valve bodies for automatic transmissions

Machine for Facing Transmission Parts

DEVELOPED for precision-facing automatic transmission parts and geared to meet high production requirements, a special Bore-Matic machine is said to provide continuous valve body production at the rate of 270 parts per hour at 75 per cent efficiency.

A constantly rotating trunnion type fixture moves the parts in a circular path between and at right angles to the two boringheads. The boringheads are in opposed positions and facing of two valve bodies clamped on either side of the fixture is done simultaneously. The 12-station fixture rotates at approximately ½ rpm, producing two finished parts every 20 seconds.

Tooling consists of two multiple tool holders, each carrying eight single point carbide facing tools. Boringheads to which tool holders are fastened are slide mounted (six in. travel) for tool change or stock removal adjustment.

In normal operation, operator attention is limited to loading and unloading parts. Foot treadle operated fixture release leaves operator's hands free to unload and load sets of parts during a 60 deg segment of fixture rotation, without stopping the machine.

Raw parts pass through checking stations prior to machining. Micro switches connected to the checking mechanism stop fixture rotation if part is improperly loaded or has excessive stock. Pushbutton reverses fixture rotation for repositioning or removal of defective part. Cycle control is completely pushbutton. From the machining standpoint, this Bore-Matic removes 0.050 in. of stock (aluminum) and provides a finish of 20 micro or better with flatness.

While this machine is primarily designed for manual loading and unloading, special conveyor and part-handling equipment can turn this into a completely automated setup. *Heald Machine Co.*

Circle 50 on postcard for more data

Speed Reducers

OF new design, a versatile line of helical speed reducers has been developed to meet the need for heavy-duty, low-cost gear drives on conveyors, machines and process installations where mounting flexibility is important. Eighteen different sizes of these new "In-Line" speed reducers (in single, double or triple reductions) are available from stock. Features include quiet, crown-shaved and induction-hardened helical gearing; oversize thrust bearings; large overhung load capacity and positive oil bath lubrication for gears and bearings. Backstops can be furnished with the reducers, or installed in the field without further machining of housings.

All bearings, housings and gears are in conformance with AGMA specifications. Units are available in reduction ratios from 1.25 to 1 to 205 to 1, and in horsepower capacities from 1 to 110. For installation in virtually any mounting position, they may be directly coupled, or driven from chain or belt drives on either the driver or driven shafts—or both. *Philadelphia Gear Works.*

Circle 51 on postcard for more data

Pinion Gear Marker

KNOWN as the Model 395, a fully automated pinion gear marker is specifically designed to mark code numbers on pinion gears as they come off the production line. A single-purpose unit, it is fed by a conveyor chain which carries the pinions under the concave lettering tool, after which they are rolled to the discharge chain from which they are ejected. Production rate is 900 parts per hour.

The machine is driven by a one horsepower motor, which drives the rotating feed spider as well as the feed and discharge chains. A pneumatic cushion is provided in the die holder to accommodate diameter variations, thus insuring uniform depth of marking on both low and high tolerance limits. Parts are rolled into locator chamber from which they are

Schmidt Model 395 pinion gear marker

picked up by chain feed, thus accurately locating the impression.

Dies may be made solid for fixed reading, or they may be made up of individual type providing flexibility in marking. *Geo. T. Schmidt, Inc.*

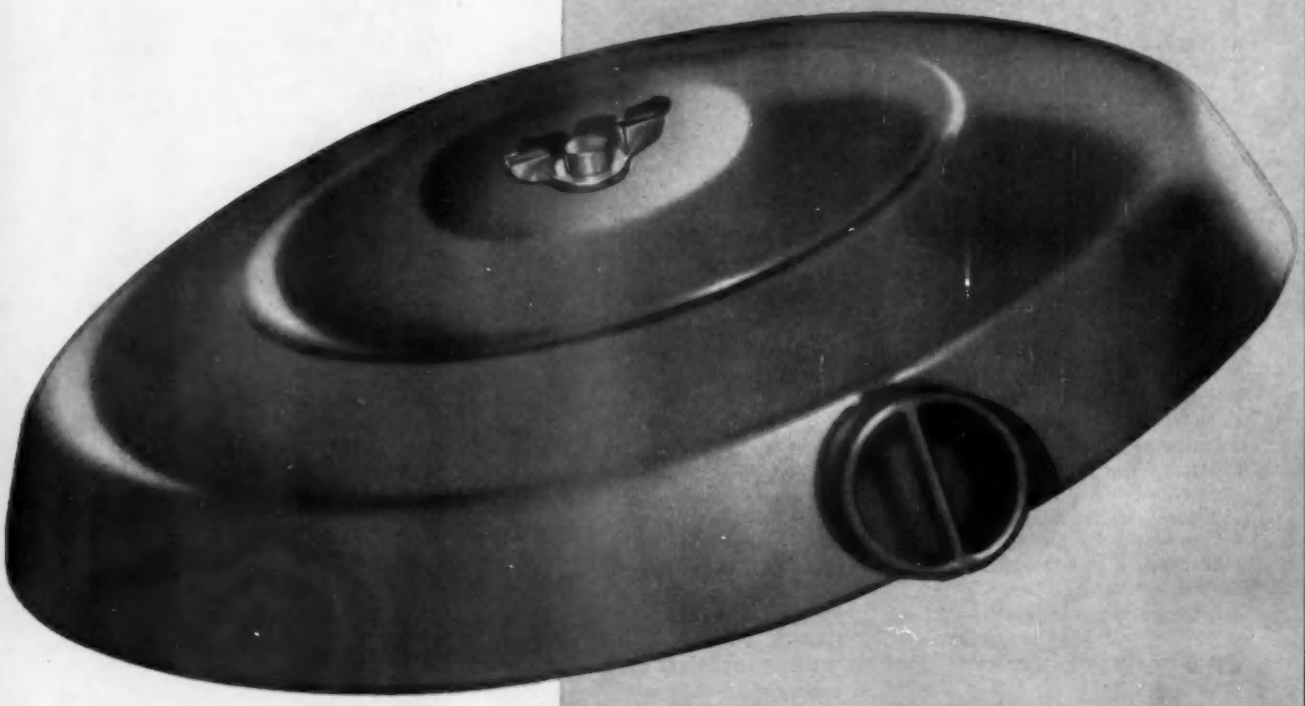
Circle 52 on postcard for more data

(*Turn to page 174, please*)

In Air Cleaner-Silencers "LOW HAT" is Now the style

THANKS TO

HOUDAILLE CONDUIT TUNING*



*Patents Pending

Conduit Tuning...an exclusive Houdaille development...has simplified air cleaner-silencer design and lowered heights to meet the space limitations of modern hood styling. These new Houdaille units eliminate noises over a wider range of frequencies...and do not require the critical tuning to specific frequencies necessary with resonator-type silencers.

Houdaille's extensive engineering and research facilities are at your service to cooperate in the perfection of air cleaners and silencers of *any* type to meet your specific needs.

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Depreciation Factors 1

The significance of depreciation accounting with special reference to plant replacement, and depreciation as a tax problem are the "Two Views on Depreciation" published in a 20-page booklet released by *National Automatic Tool Co., Inc.*

Gravity Conveyors 2

Bulletin 801 deals with a line of wheel and roller type gravity conveyors in eight fully-illustrated pages, including accessories and installations. *A. B. Farquhar Div., The Oliver Corp.*

Fluid Power 3

Copy of 20-page booklet entitled "How Fluid Power Serves Industry and You," and published by the *National Fluid Power Association*, is now available from *Miller Fluid Power Div.*

Plastics Terms 4

A "Glossary of Plastics Terms," listing some 85 definitions, is available from *The Richardson Co.*

Thin-Wall Tubing 5

Data Memorandum 4 covers thin-wall tubing ranging in size from ⅝ to 2½ in. outer diam and with wall thicknesses of 0.035 in. and less, in both the seamless and Weldrawn grades. *Superior Tube Co.*

Grooving Machines 6

Illustrated Bulletin 76-C, four pages, presents the modernized No. 48-U universal power grooving machine equipped with a multi-purpose horn for closing both single and Pittsburgh lock seams, as well as hand-operated and giant power groovers. *Niagara Machine & Tool Works.*

Laminated Plastic 7

The characteristics and uses of many grades of vulcanized fiber, including their physical and chemical properties, as well as fabrication methods, are covered in an eight-page reprinted article made available by *National Vulcanized Fibre Co.*

Positioning Table 8

An automatic positioning table that may be used in combination with a drilling machine, miller, or other machine tool to perform any of the usual machine tool operations is described in a two-page bulletin and reprint made available by *Binotrol Div., Barnes Engineering Co.*

Overhead Trolleys 9

Bulletin 56-2 covers improved low-friction 4 in. and 6 in. overhead conveyor trolleys. In addition to standard units, special designs of "lubricated for life," heavy load-light pull, and heavy-duty attachments are described. *Anchor Steel and Conveyor Co.*

(Please turn page)

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FORGED CARBON AND ALLOY STEEL HAND TOOLS.

FREE LITERATURE—*Continued*

Teflon Products 10

Twelve-page brochure, Form T-110, lists products fabricated from Du Pont Teflon, including mechanical and hydraulic packings; O-rings; flexible bellows; sheet, rod, tubing, and tape; molded and machined parts for mechanical equipment, etc. *Crane Packing Co.*

Tool Control Units 11

A four-page catalog lists various models of the Cy-Co-Trol tool control units designed for users of transfer or progress-thru machines involving multiple tooling. *Royal Design & Manufacturing, Inc.*

Data Handling 12

Newly developed systems for data handling and a new series of analog computers are covered in Catalog C-703, eight pages. Included are engineered systems for data reduction, data logging, industrial measuring and recording, and industrial process control. *Berkeley Div., Beckman Instruments, Inc.*

Hole Borer 13

Details of a new precision hole borer for drilling or boring repetitive pieces at high speed are given in a four-page booklet made available by *Canton Tool Manufacturing Co.*

Solenoid Valves 14

Catalog 201, 32 pages, lists two-, three-, and four-way solenoid valves, and includes engineering information, flow charts, and operation and construction details. *Automatic Switch Co.*

USE THIS POSTCARD

AI Index 15, 16

Check 15 on postcard for index to Vol. 114 (Jan. 1 to June 15, 1956) of AUTOMOTIVE INDUSTRIES. A limited number of copies of the index to Vol. 113 (July 1 to Dec. 15, 1955) are also available. Check 16 if you wish this index also. *Automotive Industries.*

Testing 17

A revised edition of "Seeing Isn't Always Believing," a 14-page booklet on the general aspects of non-destructive testing, includes information on latest developments such as electronic eddy current and magnetic sensing instruments, and new fluorescent penetrants. *Magnaflux Corp.*

Hydraulic Components 18

Bulletin M5101A, 20 pages, discusses the performance characteristics, construction details, and applications for a line of single-vane and double-vane pumps, multiple unit valves, relief valves, reservoirs, fluid motors, power steering boosters, and power packs for mobile equipment. *Vickers Inc.*

Barrel Finishing 19

Barrel-finishing methods and materials recommended for the various types of procedures are discussed in an illustrated folder issued by *Oakite Products, Inc.*

Tool Steels

The fourth edition of the 204-page "Tool Steel Handbook" contains latest information on types, properties and applications of tool steels. Address request on company letterhead to *Allegheny Ludlum Steel Corp., 2020 Oliver Building, Pittsburgh 22, Pa.*

Pearlitic Malleable

The strength and machinability of pearlitic malleable iron in highly stressed parts is the subject of a new 24-page booklet. Data on its metallurgical characteristics, hardenability, elevated-temperature properties, and application are included. Address request on company letterhead to *Research Dept., Albion Malleable Iron Co., Albion, Mich.*

Tool Grinding

"A Handbook on Tool Room Grinding" is the title of a 222-page booklet recently published, which combines information found in three prior booklets covering general tool grinding, carbide tools and cast alloy tools. Form 781. Address request on company letterhead to *Norton Co., Worcester 6, Mass.*

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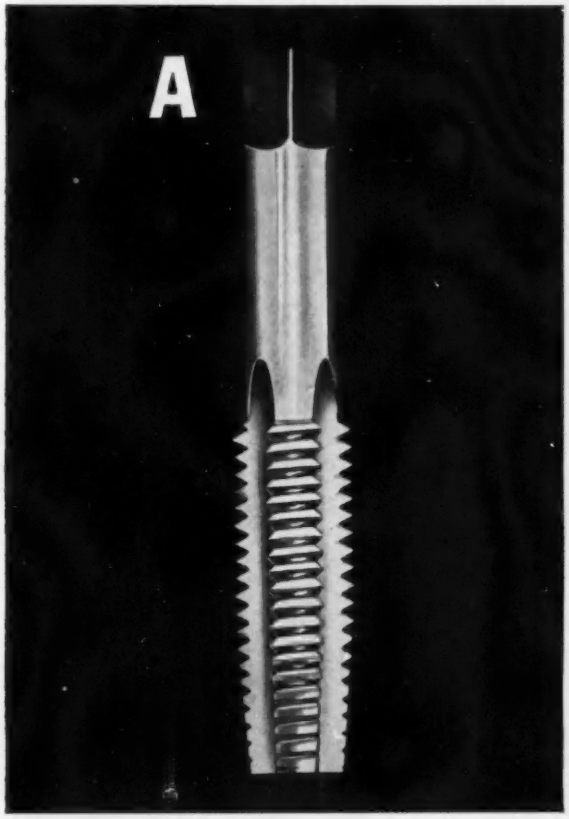
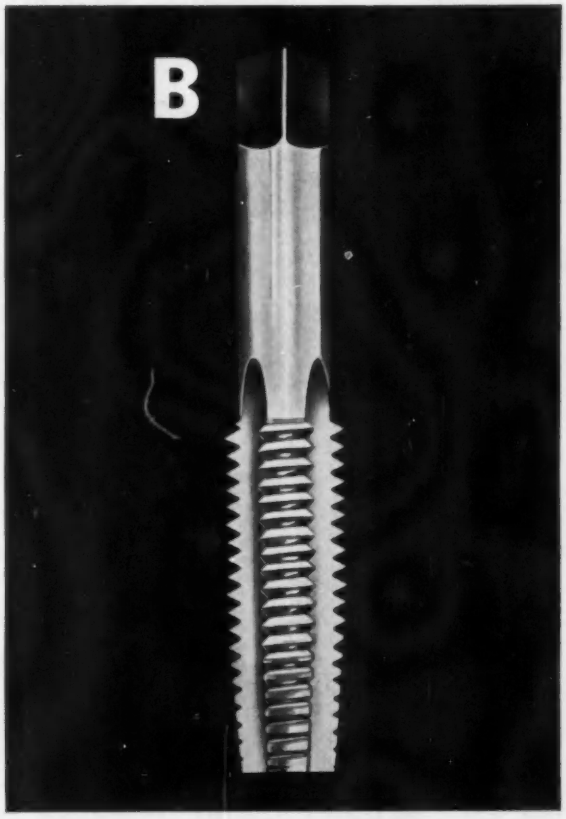
WHICH OF THESE TAPS COULD NEVER GET PAST HY-PRO'S ELECTRONIC ANALYZER?





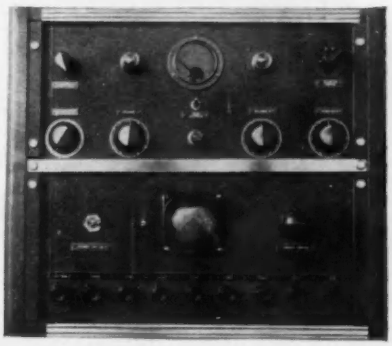
The serious defect in Tap B is invisible. But Hy-Pro's Electronic Analyzer detects all structural flaws for your protection.

HY-PRO's amazing new Electronic Analyzer is one of the three important steps which Hy-Pro takes to insure you of *3-way Quality Control*. These three steps are the Electronic Analyzer, advanced Heat Treating and the Micro-Hardness Tester.

Here's how the Electronic Analyzer works. A standard tap, perfect in every detail, is put in one side of the machine. The tap to be tested is put in the other side. Electronic impulses are shot through both taps and every inch of each tap is tested as to composition, surface condition and internal structure.

The Hy-Pro Electronic Analyzer reveals every defect, including those that laboratory, production tapping and destructive tests fail to uncover!

The best part of the Hy-Pro story is that you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor or call us direct. Hy-Pro *quality-controlled* taps—products of the Tap Specialists—cost no more than ordinary taps.



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HY-PRO

"The Tap Specialists"

New Bedford, Massachusetts, U. S. A.

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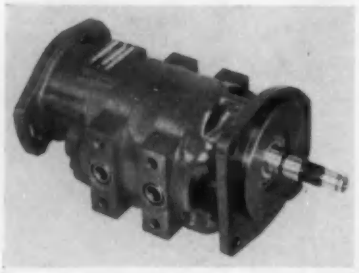
NEW PRODUCTS
AUTOMOTIVE - AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Hydraulic Pump

The special Hydreco series 1500 dual gear type hydraulic pump, which operates at pressures up to 1500 psi at 2000 rpm, is designed to power the steering control on both right and left-hand tracks of large crawler



equipment. It has a through shaft to provide drive for magnetos and other auxiliary components.

Pressure-balanced wear plates keep volumetric efficiency high at all pressures. Balanced hydraulic forces on both sides of the plates are said to maintain fixed clearances between plates and gear faces so oil slippage is reduced to a fixed minimum and frictional contacts are eliminated.

The unit illustrated is designed particularly for direct-mounting on transmissions, and many modifications of this new pump assembly are available. *New York Air Brake Co.*

Circle 60 on postcard for more data

Rubber Floats

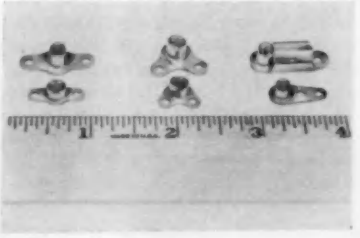
Floats of hard unicellular rubber sponge, fabricated to customer specification, are now being produced. The new material of minute sealed-cell structure, is lighter than cork, will withstand higher temperatures, is resistant to fungus growth, needs no protective coating, maintains stable weight and volume and is not subject to becoming "water-logged," according to the announcement. It can be drilled or otherwise machined and can be molded to shape with or without metal mounting arm. It has a specific gravity of .14. Laboratory testing indicates the material is suitable for use in water, oil, gasoline including aviation fuels, and various other liquids, over a wide temperature range. *Parker Appliance Co.*

Circle 61 on postcard for more data

Space-Saver Locknuts

For fastening applications where space allowables are reduced to a minimum and low weight is of paramount importance, a line of miniature self-locking anchor nuts has been developed that is said to meet the same tensile, vibration and temperature requirements as standard AN366 locknuts of similar configuration. Present "Space Saver" configurations include a two-lug anchor nut plate LHTA1M, a corner anchor LHTA5M, and a one-lug anchor LHTA17M. Anchor configurations are designed for applications where the nut is "fixed" to the basic structure to provide a blind fastener in inaccessible locations. The offset-crown, self-locking device assures safe, repeated reuse during maintenance, it is claimed.

Made of carbon steel, heat treated and cadmium plated, their weight is approximately one-third that of standard AN366 locknuts. In the illustration, the new anchor nuts are contrasted with the company's standard size lightweight nuts shown in the top row. Meeting the performance requirements of AN-N-10 for temperatures up to 500 F, the three configurations are available in four thread sizes of 6-32, 8-32, 10-32 and ¼-28. *Elastic Stop Nut Corp. of America.*

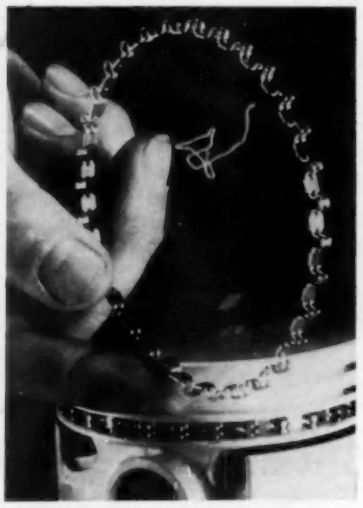


Circle 62 on postcard for more data

Oil Ring Expander

Stainless steel expander-spacers for oil rings, of a new design and using a new material for this purpose, give improved operating results according to a recent announcement.

The type 201 stainless steel (chrome - nickel - manganese) used in this application is reported to obtain



its spring properties from the forming operations necessary to produce the part and to need no further hardening operations after forming, thereby avoiding warpage. The design of the ring is also stated to be unique in that the spacer portion of the expander is blanked rather than formed in a punch press, thus eliminating inaccuracies caused by springback.

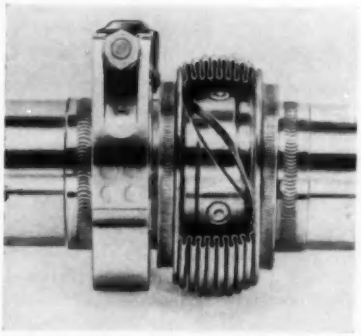
The yield point of the material is said to be higher than previously-used materials, resulting in the ring retaining its tension over a longer period of time. Corrosion and breakage are further said to have been virtually eliminated with the use of this stainless steel.

Sealed Power Corp. developed the new assembly with *Allegheny Ludlum Steel Corp.*, suppliers of the steel.

Circle 63 on postcard for more data

Joint for Ducting

For use on aircraft ducting, a new universal joint designated MB11 was developed to meet the severe flexure and vibration characteristics of supersonic aircraft ducting systems. Capable of handling a high volume of gases at temperatures from —300 F to +800 F, the joint produces negligi-



ble pressure drop at zero angular deflection. The pressure drop is 8 per cent of the velocity pressure at 3 deg deflection and 11 per cent at 7 deg. The maximum angularity of the joint is 10 deg in any direction. The 2-in. size, currently in production, was subjected to 800 psig burst pressure and more than 600,000 cycles through 5 deg angle at 200 psi and 800 F.

The joint is designed to prevent the transmission of either torque or end load into the bellows. The internal design is said to prevent bellows failure from resonance associated with high velocity gas flow. Constructed entirely of high-temperature corrosion-resistant materials, the internal parts are machined to close tolerances, assembled and stress-tested before the bellows are seam welded to the unit. After assembly a pneumatic proof test is made and the joint is ready for installation. The joint can be furnished as an integral part of the ducting or with J11 series joints for convenient disassembly. *Marman Products Co., Inc.*

Circle 64 on postcard for more data

Acrylic Resin

The availability of a new formulation of Lucite 140 with improved thermal stability and flow has been announced. Its upper molding limit, the maximum temperature to which it may be heated in a normal molding cycle, has been increased. Tests indicate the formulation retains stability at 20 to 30 F above the maximum of other acrylic resins. This improvement is expected to be beneficial especially where complex or hard-to-fill forms are required.

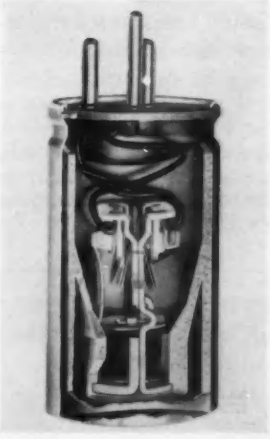
With improved flow, the material is said to provide thin parts with fewer surface blemishes and flow lines, and thicker parts without voids. In some instances, shorter cycles have resulted. In addition this advance may provide the end-user with parts more resistant to solvents and distortion by heat. *E. I. du Pont de Nemours & Co.*

Circle 65 on postcard for more data

Vibrator

Instead of conventional contact buttons, a new vibrator utilizes the vibrating reed and side arms themselves as contacting elements by designing these parts of special contact alloy. The result is greater contact area, and from 50 to 100 per cent longer life in service, according to the announcement.

Sticking of contacts is said to be eliminated, and wear is distributed over a far larger surface than previously possible. Simplified construction permits the use of automatic production techniques which assure high uniformity of characteristics. Mechanical hum is reportedly held to a new low level, due to the lighter mass of the mechanism in this design and to refinements in noise reduction. More compact construction reduces

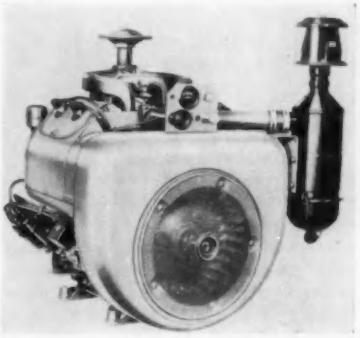


vibrator size from that previously required to handle comparable outputs. The 1600 series vibrator is available in ratings suitable for automobile radios, headlight dimmers, and similar applications. *P. R. Mallory & Co., Inc.*

Circle 66 on postcard for more data

V-4 Air-Cooled Engine

Designated as the Model VH4, a new 30 hp, four-cylinder, V-type, air-cooled engine operates at a maximum speed of 2800 rpm and is said to be of basic high torque design and heavy-duty construction. The manufacturer reports that it is a smooth-running, even-firing engine, and can



be adapted to operate on kerosene, natural gas, LP fuels or fuel oil of 38-42 deg Be gravity and 35 octane rating.

Special equipment available includes hydraulic pump, visual-type air pre-cleaner, rotating screen, automatic high temperature switch, electric generator and starter (or starter only), clutch assembly, reduction assembly or clutch-reduction assembly. The VH4 will be supplied as an "open engine" with or without side-mount fuel tank, or as a completely housed power unit with either built-in or underslung fuel tank. *Wisconsin Motor Corp.*

Circle 67 on postcard for more data

Silicone Defoamer

A new faster-acting, more stable silicone defoamer, Antifoam B, has been developed. Useful in a wide variety of applications, it is generally effective at concentrations in the range of 3 to 30 parts per million. Instantly dispersible in aqueous systems, it may be added "as is" without stirring or agitation. Because it has extremely small particle size, it also stays in suspension longer. Suitable for continuous processing, it will not oil out, plate out, settle or precipitate in most applications. Resistant to heat or cold, Antifoam B retains its effectiveness even after being exposed to high or low temperatures, it is further stated. *Dow Corning Corp.*

Circle 68 on postcard for more data

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Holley Carburetor Signs Pact With British Firm

Interest in fuel injection for automobiles continues to grow as supplier companies push efforts to develop an efficient low-priced system which they could present to automobile manufacturers. Holley Carburetor Co., longtime supplier of standard carburetors to the automobile industry, announced that it has signed a license and engineering agreement with Joseph Lucas Industries, Ltd., of Birmingham, England. Under the pact, the two concerns will exchange all engineering knowledge of gasoline injection systems for automotive engines.

Steel Coating Deemed Hastening All-Aluminum Engine Evolution

A wear-resistant coat of metal, thinner than a sheet of blotter paper, reportedly has removed a major roadblock in the development of an all-aluminum engine.

Aluminum Co. of America, cooperating with Metallizing Engineering Co., Inc., of Westbury, N. Y., states that a highly wear-resistant coating of sprayed steel can be applied on aluminum cylinder walls. This provides a far superior bearing surface for conventional rings and aluminum pistons.

Recent successes are said to be the result of an excellent adhesion between the steel bearing surface and the aluminum cylinder achieved by Metco's patented "Sprabond" process. This technique requires a super-thin layer of pure molybdenum between the aluminum and steel to serve as a bonding material.

Motor Vehicle Registrations In Australia Set New Record

Registrations of new motor vehicles in Australia during 1955 at 239,346 were a record. This was about 31,000, or 15 per cent, above the previous record year (1954), when 208,025 vehicles were registered.

Sales leaders, by registrations, were again General Motors-Holden's Ltd., British Motor Corp. Pty. Ltd., and Ford Motor Co. of Australia Pty. Ltd., which accounted for more than 70 per cent of the total.

Boeing Sales and Earnings Show Appreciable Increase

Boeing Airplane Co. has reported sales of $407,334,045 and net earnings of $14,488,789 for the six-month period ended June 30, 1956. Sales for the similar period of 1955 amounted to $370,301,711, and net earnings totaled $13,635,550.

Trucks to Share Spotlight At National Automobile Show

Motor truck exhibits, representing products of 11 U. S. truck manufacturers, will occupy the entire first floor of the New York Coliseum during the National Automobile Show. The event will be held from Dec. 8 through 16. Passenger car exhibits will be on the second and third floors.

Truck exhibitors in the National Automobile Show will be the following: Chevrolet Motor Div., General Motors Corp.; Diamond T Motor Car Co.; Dodge Div., Chrysler Corp.; Ford Div., Ford Motor Co.; GMC Truck and Coach Div., General Motors Corp.; International Harvester Co.; Mack Trucks, Inc.; Reo Motors, Inc.; Studebaker-Packard Corp.; White Motor Co., and Willys Motors.

Western Metal Show to Attract Wide Attention on West Coast

More than 5000 metal working companies in the U. S. and Canada have received floor plans for the 10th Western Metal Congress and Exposition. To be held in Los Angeles, Calif., from March 25 to 29, 1957, it is the robust younger brother of the Metal Society's National Metal Exposition and Congress. The latter will be held this year in Cleveland from Oct. 8 to 12.

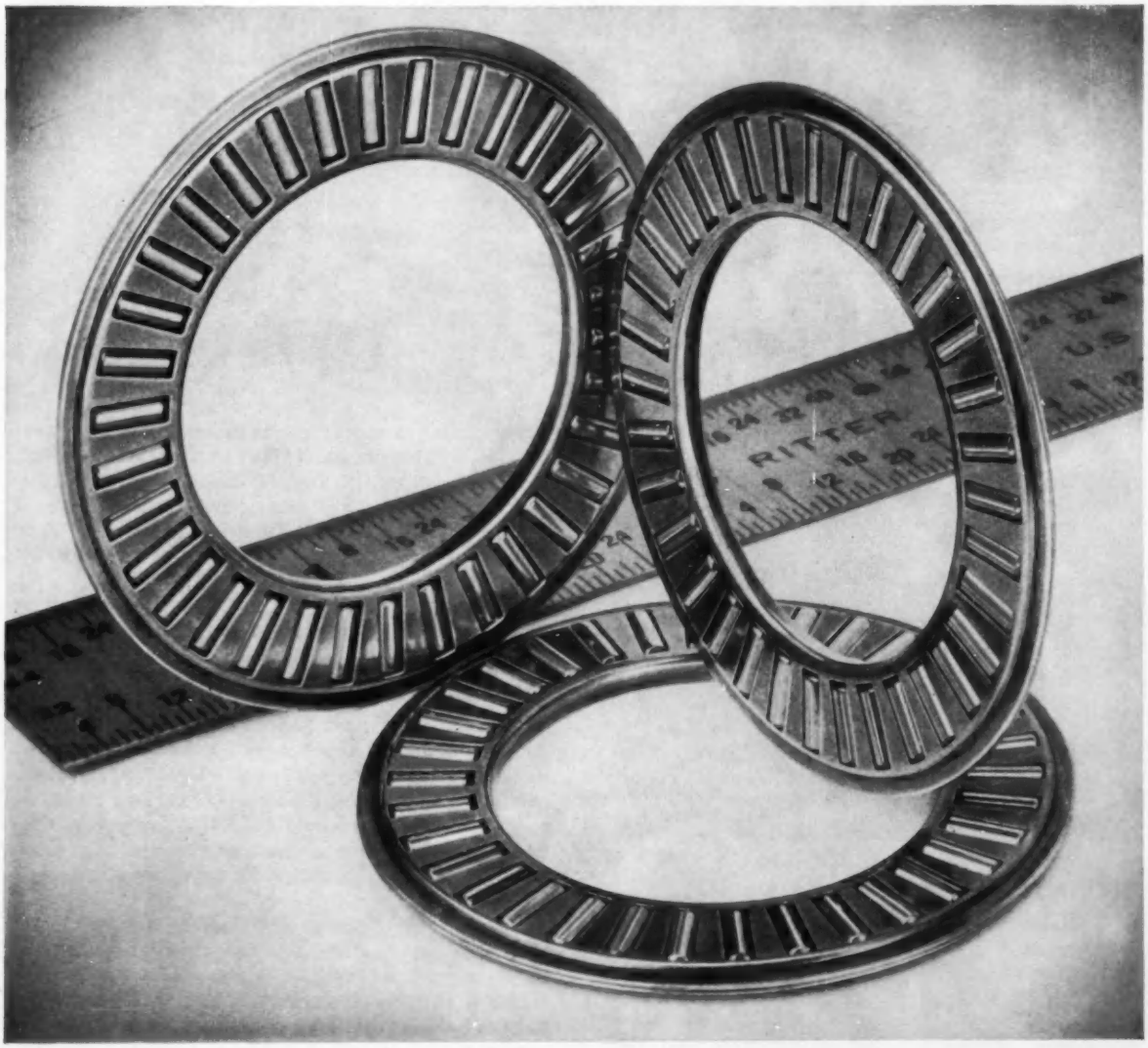
(*Turn to page 136, please*)

JUNE PROVES TO BE BETTER MONTH THAN MAY BUT SIX MONTHS DOWN OVER 1955

Regional Sales of New Passenger Cars

Zone	Region	June 1956	May 1956	June 1955	Six Months 1956	Six Months 1955	Per Cent Change: June over May	June over June 1955	Six Months 1956 over 1955
1	New England	33,828	33,099	35,327	178,589	201,757	+ 2.20	− 4.24	−11.48
2	Middle Atlantic	112,583	124,734	125,296	592,449	672,612	− 9.74	−10.15	−11.92
3	South Atlantic	64,785	70,203	87,925	386,443	437,632	− 7.72	−26.32	−11.70
4	East North Central	126,889	136,553	165,929	771,644	899,200	− 5.61	−22.32	−14.19
5	East South Central	24,298	25,485	33,881	155,987	171,575	− 4.66	−28.24	− 9.09
6	West North Central	45,112	48,575	58,958	266,098	308,788	− 7.13	−23.48	−13.83
7	West South Central	46,017	45,760	72,812	278,975	310,924	+ .56	−36.80	−10.28
8	Mountain	19,691	17,885	24,015	101,876	110,034	+10.10	−18.01	− 7.41
9	Pacific	64,574	57,720	77,249	358,428	407,107	+11.87	−16.41	−12.45
	Total—United States	539,777	560,014	681,372	3,088,487	3,519,629	− 3.61	−20.78	−12.25

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.



Here's the **NEW** Torrington Needle **THRUST** Bearing!

Now designers have available a *needle bearing* exclusively for heavy *thrust* loads.

This compact Torrington Needle Thrust Bearing—only .0781" in cross section—is no thicker than an ordinary thrust washer. Yet it brings all the advantages of anti-friction operation at low unit cost for many thrust applications.

Two mating retainer halves, highly accurate steel stampings, are securely joined to form a self-contained unit closed on OD and ID. The bearing can run directly on adjacent parts, hardened to act as races, or on economical hardened and ground flat races. The bearing is piloted on the retainer bore.

In any thrust application where low unit cost, high thrust capacity and compact design are primary factors, consider the Torrington Needle Thrust Bearing. Services of our Engineering Department are available to assist you with design and application.

Send for our new Bulletin, "No. 17—Torrington Needle Thrust Bearings," for full information.

Highly successful applications of the Torrington Needle Thrust Bearing have been made in automatic transmissions, governors, steering gears, bevel gears, hydraulic pumps, and torque converters.

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TORRINGTON BEARINGS

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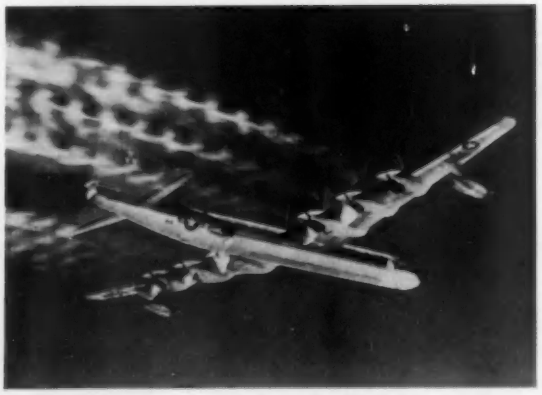
AIR BRIEFS

By RALPH H. McCLARREN



Nuclear Test Airplane

A vital new national defense role for the Convair B-36 intercontinental bomber is pictured here (see illustration) for the first time—as the world's first aircraft to fly with an operating atomic reactor aboard. Designated the NB-36H, the aircraft was modified by the Fort Worth, Texas, plant Convair Division of General Dynamics Corp.

Flight tests have been continually changed over a period of time to determine the effects of radiation of the nuclear reactor upon instruments, equipment and the structure of the airplane. Methods of shielding the flight crew, reactor operators and electronic devices are being tested and checked.

The reactor is not used to power the aircraft and it is never turned on until the NB-36H is high over unpopulated areas.

Helio Aircraft Corp.

Helio Aircraft Corp. of Norwood, Mass., in July 1956, acquired the plant and organization of the Mid-States Manufacturing Co. of Pittsburg, Kan., thus becoming the fifth largest manufacturer of business and private aircraft in the United States. The main product of the combined companies will continue to be the Helio Courier airplane, the first of the new so-called STOL (short take-off and landing) type aircraft to obtain a U. S. Approved Type Certificate. While similar in appearance to conventional airplanes, the new STOL type, as typified by the Helio Courier, can fly in and out of a space smaller than a football field at 30 mph, yet still cruises with four passengers at over 165 mph. The Mid-States plant has been fabricating this airplane during the past year for Helio as an independent contract manufacturer. It has been sold throughout the United States and in Europe and Latin America.

New Magnetic Core Material

The Naval Ordnance Laboratory at Silver Springs, Md., has developed a new high permeability magnetic material intended to replace powdered molybdenum-permalloy. Known as Flakenol I, this new magnetic core material is especially adaptable for use in electronic filters and communications systems. It is composed of iron, silicon, and aluminum (all nonstrategic materials).

Flakenol is the first satisfactory substitute for molybdenum-permalloy since this alloy was discovered 20 years ago. However, it is more than a substitute, it has a permeability almost twice that of the older material and also has very low eddy currents in loss coefficients.

Best results are obtained by heating the alloy powder to about 500 C. Then it is rolled between two rollers at room temperature, producing a thin flake of magnetic core material.

Air-Early-Warning Aircraft

Continuing its diligence to produce the most advanced equipment for early warning of unidentified aircraft, the United States Navy has developed, in cooperation with the Lockheed Aircraft Corp., a new AEW. The aircraft has just completed initial flight tests at Edwards Air Force Base, California.

The basic plane is a Lockheed Super Connie modified to carry a 30-ft discus structure which spreads over the top of the aircraft like a large umbrella. Much of the radar search gear is enclosed in this circular flat wing above the aircraft. In one sweep of its radar the aircraft can scan the sky over 45,000 sq mi of area.

Aircraft equipped with early warning radar are

(*Turn to page* 124, *please*)

Do your present truck heaters have a ----,

PARTS

"Repair or Replace"

WARRANTY

good for one year or

5	0	0	0	0

miles?

EVANS
custom-designed truck heaters have it!

Your Evans Truck Heaters *have* to be good! To prove it, Evans backs every single heater they build with a full year—or 50,000 mile—warranty (whichever occurs first). This is your assurance—and your *customers'* too—that Evans Heaters are the *right* heaters for the trucks you build.

What's more, the heaters Evans engineers design and custom-build for you will meet *all* your truck requirements. They will fit *right*—for quick, easy installation. They will deliver all the BTU's needed for maximum driver safety and comfort—under *any* weather conditions. And special, heavy-duty construction means that the owner gets longer service with much less maintenance.

There's an Evans Heater for *every* type commercial vehicle, from local panel delivery truck to giant over-the-road haulers. Why not let Evans solve your truck heating problems, whatever they may be?

FREE Consulting Service and Heater Catalog! At no cost to you, one of our engineers will call to discuss your heater problems for any truck model, present or future. And write now for your free Evans heater catalog! Address: Evans Products Company, Dept. P-9, Plymouth, Mich.

EVANS

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The BUSINESS PULSE

Heavy Demands for Funds in Relation to Supply Will Mean Higher Costs for Users of Borrowed Money. Business Activity Continues at High Level with Indications that Volume Will Hold Up Well and May Even Increase During the Coming Months

This Survey Is Prepared exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York

Rising Money Rates

The broad advance of money rates during August certainly qualifies as one of the highlights of the summer business period. It was the direct result of the heavy demands for funds that have been made by both private and public borrowers. Its consequences are strictly a matter of guesswork at this writing, aside from the certainty that it means higher operating costs for all those who use borrowed money. But the results conceivably could be far-reaching.

The higher structure of rates might, for example, take some of the zest out of the investment boom and could have adverse effects on sales which are dependent on mortgage and installment money. These things are only possibilities, of course, and they are not judged likely to come to pass quickly, if in fact they do at all. Yet some analysts believe these consequences may appear in course of time, particularly if on top of the higher costs there persists a lack of availability of credit. To the extent, however, that the higher structure of rates is indicative of an inclination on the part of the Federal Reserve System to sanction a continuing tight money-market situation, it lessens the possibility of a new inflationary spiral, such as has been discussed in recent months.

It is important to understand the role played by the Federal Reserve System during the period of rising money rates. It did not bring about the higher structure of rates by its own direct action. Rather, its performance was primarily passive, in that it neither added to nor substracted from the supply of credit through open-market operations to any important extent during the period of rising rates. Instead, it gave relatively free rein to market forces, letting the market tighten itself as a mounting demand for credit pressed against a more or less constant supply. Evidence of excessive credit demands in relation to supply was perhaps most evident at first in the bond market, where prices weakened rather appreciably. As bond yields rose, a number of planned new issues were deferred by corporations, which turned to commercial banks to obtain stop-gap funds. This put an especial strain on commercial banks, since they were already under pressure to satisfy normal seasonal requirements, including substantial borrowings by the United States Treasury. These developments led to a tightening of member-bank reserve positions, and banks thus found it necessary to dispose of securities, principally United States Government securities, in order to extend new loans.

Against this background, it was not surprising that commercial banks increased their "prime" lending rate from 3¾ per cent to 4 per cent, and advanced from 4 per cent to 4½ per cent the interst charged to brokers and dealers to finance the purchase of securities.

The adjustments in these rates were followed shortly by the Federal Reserve's approval of a rise in the discount rate at nine of the district banks from 2¾ per cent to 3 per cent, or to the level that has prevailed in the San Francisco and Minneapolis districts since April. These higher discount rates were especially indicated in view of the fact that the yield on new issues of Treasury three-month bills had risen above the 2¾ per cent level, a situation which made it technically possible for member banks to earn a profit by borrowing from the Reserve banks for the purpose of buying bills.

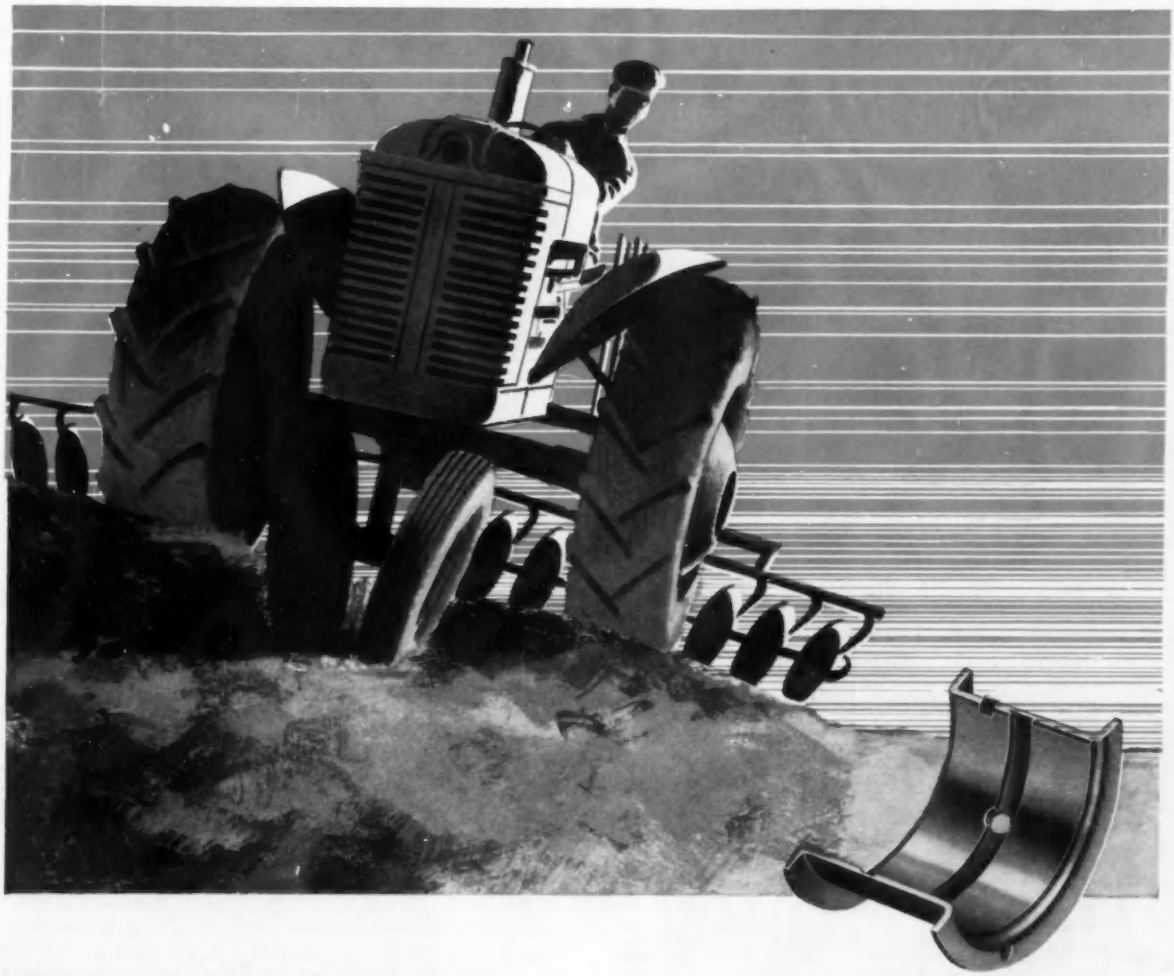
The Federal Reserve might, of course, have tried to prevent the rise in money rates by supplying additional funds to the market through the purchase of Government securities. To have done this, however, would have been to run the risk of unleashing the inflationary pressures which many analysts believe to be latent in the credit situation. The decision to allow rates to rise suggests that Reserve officials still regard overexpansion rather than recession as the principal threat to stability.

Business Volume High

It would be difficult to quarrel with this view at present. Business activity continues very high, with numerous indications that volume will be well sustained and may even increase in coming months. The economy has shown impressive strength during the

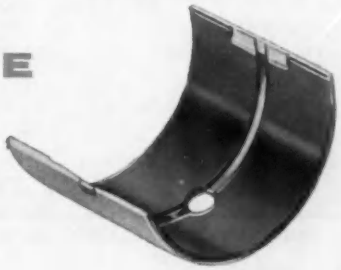
(*Turn to page* 158, *please*)

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING



his first requirement is . . .

DEPENDABLE PERFORMANCE



Ingenious mechanical equipment has solved the labor problem for today's farmer. But his first requirement of any unit is dependability of operation—around the clock if need be—in his constant battle with nature. Federal-Mogul bearings have been assuring dependability in farm tractors and implements for generations. The same dependability characterizes Federal-Mogul bearings in any application, from automobiles to construction equipment—dependability that is the product of over 50 years' highly specialized bearing manufacture.

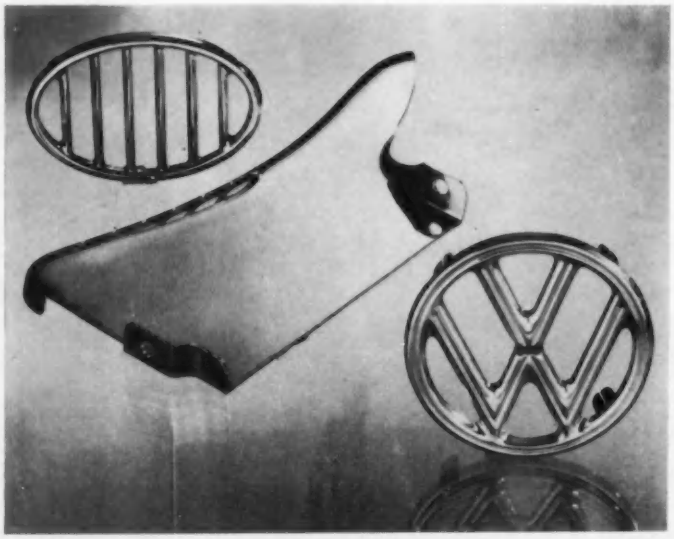
FEDERAL-MOGUL DIVISION

FEDERAL Mogul

SINCE 1899

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

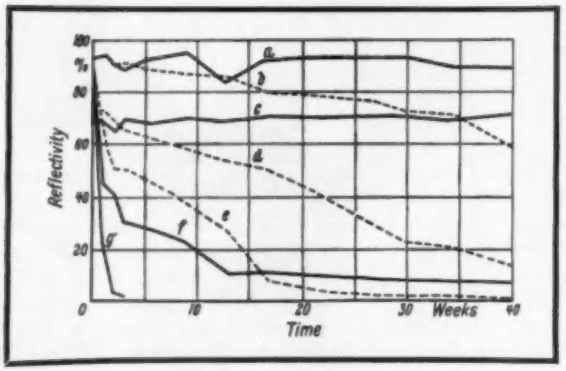
High Purity Aluminum *Used in* German Cars



Interesting automotive applications of Lurium high purity aluminum. Upper left—Volkswagen air intake grill. Center—Mercedes air intake baffle. Lower right—Volkswagen emblem.

Alloy	Nominal Composition, % Al	Mg	Other Elements	Temper	Typical Mechanical Properties Tensile Strength, Psi	Yield Strength (0.2%) Psi	Elongation, % minimum	Brinell Hardness
L	99.99	—	0.01 max	Soft	8,500	3,500	40-60	13-18
				Half hard	13,000	10,000	8-15	18-25
				Hard	20,000	18,500	4-8	26-35
L5	Balance (99.99% Al)	0.4-0.6	0.02 max	Soft	14,200	5,800	20-40	22-28
				Half hard	21,400	20,000	6-15	35-45
				Hard	27,000	25,800	2-6	40-50
L10	ditto	0.8-1.2	0.02 max	Soft	18,600	7,100	20-35	30-35
				Half hard	24,200	21,400	6-15	40-50
				Hard	35,500	30,000	2-6	50-60
L20	ditto	1.6-2.5	0.02 max	Soft	28,600	14,300	20-35	40-50
				Half hard	35,000	32,600	6-15	55-75
				Hard	50,000	45,500	2-5	70-80

Composition and mechanical properties of Lurium



Reflectivity properties—expressed as a percentage of a silvered mirror—of Lurium and various metals.
a—Brightened and anodized Lurium.
b—Lacquered silver.
c—Stainless steel.
d—Chrome plated steel.
e—Rhodium plated silver.
f—Smooth polished aluminum without any anodizing.
g—Nickel plating.

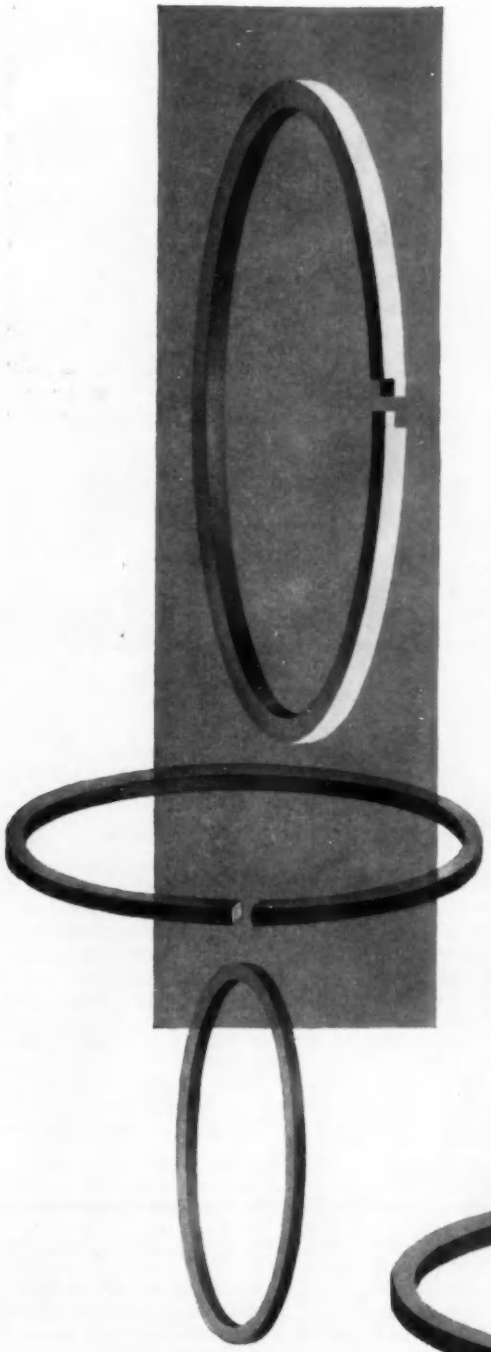
SEVERAL of the large European passenger car producers in 1956 have turned to anodized high purity aluminum alloys for many trim and functional components. Because of its very nature, this new family of alloys provides an exceedingly high degree of reflectivity and brilliance, plus the high corrosion resistance of an anodized finish.

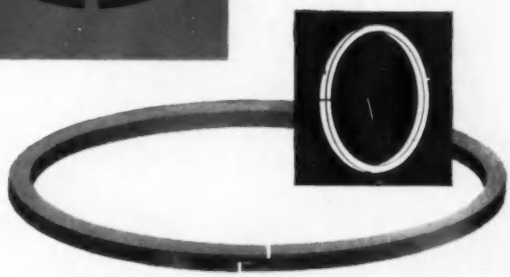
Volkswagen is probably the largest single user in the passenger car field of this high purity aluminum. The company is turning out such items as horn grilles, window frames, trim strips, name plates, and belt moldings for its line of cars. Mercedes-Benz also utilizes the aluminum alloy for trim strips and window frames. Porsche is currently putting it on cars as bumper overriders. Probably the most interesting application of this material is the forged bumper produced for the Borgward Goliath car. This same company is also stamping out bumper guards from the high purity stock. Other firms are using it in the form of hub caps and wheel covers also produced in stampings.

Made in Germany under the name Reflectal, the material is being distributed in the U. S. under the trade name Lurium by the Fromson Orban Co., Inc. There are four basic alloys in the Lurium group, and their physical properties lie roughly between alloys 1100 and 5502. The primary alloy is composed of 99.99 per cent pure aluminum, while the other three Lurium alloys—types 5, 10 and 20—contain 0.5, 1.0 and 2.0 per cent magnesium in respective order.

The alloy most commonly used by the automobile

(*Turn to page* 120, *please*)





Sealed Power has been

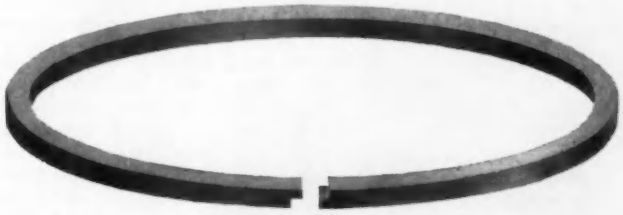
SEALING RING HEADQUARTERS

ever since there were sealing rings!

Sealed Power made the FIRST sealing rings, for use in military tanks, 18 years ago.

Sealed Power has made the MOST sealing rings—over a hundred million of them. That's well over half of all the sealing rings ever manufactured by anybody!

By virtue of this tremendous experience Sealed Power is your best source when you need sealing rings for automatic transmissions and power steering units. When you have any kind of a sealing ring problem, bring it right to Sealing Ring Headquarters—to Sealed Power!



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Detroit Office • 7-236 General Motors Building — Phone Trinity 1-3440

Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911 • Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

Increasing Use of Selected Equipment on Passenger Cars

THE two tables, presented here, show how purchasers are specifying still more "optional" or "special equipment" items when buying new cars. In addition, it may be seen that a greater percentage of the units which previously were optional have now become standard. Comparisons are given for 1955 and 1956.

1955 MODEL YEAR

Percentage, Factory Installations Only

	Ford	Lincoln	Merc.	Plymouth	Chrys.	De Soto	Dodge	Cad.	Olds.	Buick	Chev.	Pontiac	AMC	Stud.	Packard
Automatic Trans.	54.0	STD	85.2	45.4	99.0	97.3	85.8	STD	99.8	94.5	51.3	89.4	55.0	43.0	97.5
Standard Trans.	33.0	NA	7.6	48.1	0	1.7	11.2	NA	0.2	5.5	42.6	10.6	24.0	12.2	0
Overdrive Trans.	13.0	NA	7.2	6.5	0	1.0	3.0	NA	NA	NA	6.1	NA	21.0	44.8	1.3
Power Brakes	2.0	95.0	31.8	4.0	72.0	59.6	13.7	STD	69.2	37.1	4.6	30.6	11.6	12.0	91.0
Power Steering	8.0	91.8	22.1	3.8	61.0	62.4	20.0	STD	56.6	49.0	4.6	22.5	3.2	7.0	60.4
Power Seats	2.0	83.9	9.8	1.0	18.0	8.0	6.0	75.0	18.1	11.9	0.7	0	0	1.5	28.0
Power Windows	2.0	83.9	5.4	0.6	16.0	3.6	2.6	75.0	15.8	10.0	0.7	2.2	1.1	3.0	24.0
Radios	66.0	98.9	89.3	34.9	86.0	64.1	49.2	94.0	91.7	89.0	65.0	86.6	38.8	39.0	91.0
Heaters	90.0	99.7	95.9	90.8	98.0	95.4	91.8	96.0	98.6	97.7	93.7	95.9	94.3	84.0	92.0
White Walls	46.0	97.5	77.3	40.8	81.0	72.5	56.7	9.6	80.2	78.2	33.4	63.0	49.3	56.0	88.0
Air Conditioning	0.5	10.3	1.4	0	5.0	1.5	0.6	20.0	3.5	1.9	0.4	1.5	6.6	2.0	3.0
Tinted Glass	28.0	90.2	54.8	27.4	77.0	55.5	37.6	90.0	50.3	69.9	17.4	31.8	45.5	28.0	41.0
Windshield Washers	50.0	91.2	56.3	13.3	83.0	30.7	23.3	STD	81.7	85.5	24.0	30.0	NA	18.0	81.0
Backup Lights	19.8	STD	98.6	27.0	93.0	STD	68.0	STD	60.9	83.1	35.0	87.6	NA	35.0	89.0
V-8	86.0	STD	STD	45.2	STD	STD	89.0	STD	STD	STD	43.2	STD	11.8	70.0	STD
Directional Signals	96.0	STD	STD	96.0	STD	STD	96.0	STD	STD	STD	STD	STD	94.2	93.0	STD

1956 MODEL YEAR

Percentage, Factory Installations Only

	Ford	Lincoln	Merc.	Plymouth	Chrys.	De Soto	Dodge	Cad.	Olds.	Buick	Chev.	Pontiac	AMC	Stud.	Packard
Automatic Trans.	62.0	STD	88.8	61.5	99.4	98.6	88.8	STD	98.8	96.7	60.5	93.0	60.9	55.0	99.0
Standard Trans.	30.0	NA	8.1	34.0	0.6	0.9	9.7	NA	1.4	3.3	36.0	7.0	20.5	10.3	0.1
Overdrive Trans.	8.0	NA	3.1	3.7	NA	0.5	1.5	NA	NA	NA	3.5	NA	18.5	34.7	0.9
Power Brakes	4.0	98.5	36.7	5.6	73.4	62.7	15.2	STD	70.1	50.0	6.3	33.6	61.6	13.0	93.6
Power Steering	19.0	STD	26.5	6.4	67.4	73.2	22.0	STD	59.7	56.4	7.3	28.1	7.5	12.6	68.0
Power Seats	1.0	88.0	6.4	0.3	21.0	7.5	1.4	80.0	16.8	16.7	0.4	2.8	0	2.1	30.3
Power Windows	1.0	88.0	4.8	0.4	19.3	5.6	1.3	80.0	17.5	14.8	0.5	2.7	1.0	3.2	27.0
Radios	65.0	99.0	85.0	38.8	85.6	68.3	44.1	95.0	90.7	89.8	66.5	86.5	55.0	43.5	92.0
Heaters	89.0	99.8	96.0	94.1	98.3	97.4	94.9	98.0	98.0	97.9	94.2	96.8	95.1	90.5	96.3
White Walls	50.0	96.8	78.9	46.8	83.8	78.2	53.8	98.0	80.9	83.1	40.6	69.1	54.0	62.4	85.7
Air Conditioning	1.0	16.3	1.1	0.2	7.3	2.3	0.7	25.0	4.7	3.6	0.9	2.4	6.7	2.5	4.3
Tinted Glass	22.0	94.0	52.6	19.6	62.1	52.4	21.9	93.0	44.1	69.8	16.2	28.3	39.7	28.0	54.5
Windshield Washers	43.0	STD	50.2	20.4	86.5	50.8	25.2	STD	78.0	77.4	24.0	26.2	23.0	21.8	STD
Backup Lights	39.0	STD	99.0	30.7	94.7	STD	52.8	STD	60.3	85.8	37.0	98.0	58.2	52.1	STD
V-8	89.0	STD	STD	65.0	STD	STD	66.8	STD	STD	STD	57.6	STD	13.2	71.0	STD
Directional Signals	STD	STD	STD	96.6	STD	STD	STD	STD	STD	STD	STD	STD	STD	96.0	STD

How Great Lakes Steel *launches* quality

You're at 400 feet, banking for a good close look at the unloading operation of the *Ernest T. Weir*. She's packed to the gunwales, stem to stern, with ore—tons of iron-bearing food for Great Lakes hungry blast furnaces.

What's this got to do with turning out top-quality steel at Great Lakes? Plenty! For quality pig iron can only come from quality raw materials—like the *Weir's* rich cargo. And, of course, quality pig iron is the very backbone of top-quality steel.

Control of quality at Great Lakes begins right at the mines. In fact, each ore source is picked with painstaking care. Then, repeated checks in the mines—*double checks* here at the unloading docks—put the quality of Great Lakes raw materials beyond question!

It's that kind of control (from start to finish) that gives our flat-rolled products uniform quality—assures that they will reach our customers exactly when and as ordered. We're ready to talk your steel needs whenever you are.

GREAT LAKES STEEL CORPORATION

Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

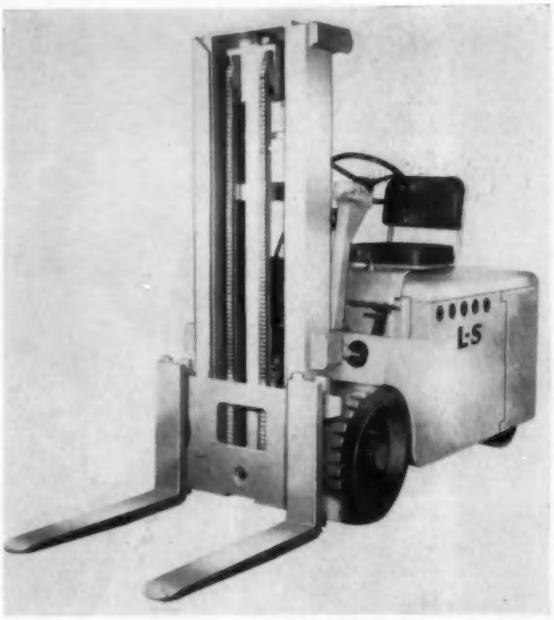
District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

TO ASSURE TOP-QUALITY OPEN-HEARTH STEEL . . . iron ore (shown stockpiled here), coal and limestone—all of known source and quality—are sampled and tested over and over again by Great Lakes Steel raw material analysts.

New Fork Truck

FEATURES

Rear Wheel Drive



Model RR truck designed for loads of 6000 and 7000 lb

LEWIS-SHEPARD Products, Inc., has come out with two new electric fork trucks that feature rear-wheel power and a number of design improvements. Application of the rear-wheel drive in this country is limited to electrically-driven materials handling equipment.

One of the advantages claimed for the rear-wheel drive is that trucks so powered can turn in their own length. With the rear wheel drive, the truck pivots about the point where its longitudinal center line intersects the front wheel axle. Steering is automotive type and steering effort is constant throughout the entire range of turn, 180 deg to each side.

The heavy traction components are placed to the rear where they serve as a counterweight to the load. Heavy plate doors and steel bars welded to them complete the counterbalance to bring the center of gravity to the rear and low.

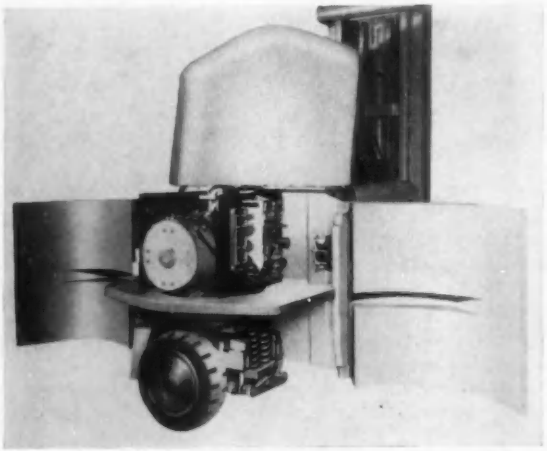
By opening these rear doors all the traction components—drive motors, gear trains, drive tires and electrical panels—are exposed. The seat hinges out of the way so that a cover can be raised for battery inspection or removal.

The drive of the heavy model (two driving wheels) is articulated so that both wheels are on the floor at the same time with equal weight on each when the truck is operating on uneven surfaces. A new feature of this model is spring suspension of the traction drive components to absorb shocks before they reach the gear train.

In both new trucks, the mast assembly is recessed into the chassis between the free rolling front wheels. The outer mast is of reinforced formed channel with tubular cross bracing. The inner mast is fabricated of a specially rolled I-beam section. The mast of the heavy-duty model is made of heavier sections.

The carriage on the trucks is of plate construction. The forks hang to a backplate of solid steel. Both carriage and inner mast ride on hardened ball-bearing rollers.

Both trucks have magnetic controls and dynamic braking. As soon as the operator lifts his foot from the accelerator, dynamic braking brings the truck to a gentle stop. To stop quickly, the brake pedal is used to apply hydraulic pressure to each load wheel and



Rear wheel drive units are connected by an electric differential. Each drive unit consists of double-reduction spur gear train with a heavy-duty compound wound traction motor.

at the same time cut off power to the traction circuit.

In addition, a "deadman" type of brake is located on the seat. When the operator leaves his seat, this brake goes on automatically.

Lifting speed on the 6000-lb capacity model is 32 fpm empty and 30 fpm loaded. The high pressure system develops up to 2800 psi. Pump and tank are located under the floorboards.

The new models have one lift cylinder and twin tilt cylinders, one on each side of the mast. The cylinders have ground, chrome-plated plungers with spring-loaded V-type self-adjusting packings. Lubri-

(*Turn to page* 142, *please*)

Aetna

America's No. 1 Producer of Clutch Release Bearings

For more than a third of a century Aetna Clutch Release Bearings have held recognized leadership in design, performance and dependability.

In terms of testimony, over 68,000,000 Aetna Clutch Release Bearings have been produced to satisfy the year-after-year demand of more than 50% of America's major producers of on-and-off-the-road mobile vehicles.

Research, a continuing Aetna program, has contributed more basic improvements, more feature "firsts" in Clutch Release Bearings than any other manufacturer.

Service records and laboratory breakdown tests (up to 1,500,000 de-clutchings) repeatedly prove the unmatched superiority of Aetna Clutch Release Bearings—in life-expectancy, lubricant retention and smooth, silent operating characteristics.

Take time—early in the planning stage, before "freezing" your designs—to test and compare world famous Aetna Clutch Release Bearings. Samples, quotations and complete engineering data are yours for the asking.

Aetna

40 YEARS Bearing Faith

AETNA BALL AND ROLLER BEARING COMPANY

Division of Parkersburg-Aetna Corporation

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In Detroit — Sam T. Keller, 1212 Fisher Building

Manufacturers of: Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Parts

NEW 8 CHANNEL

Sanborn oscillographic recording system

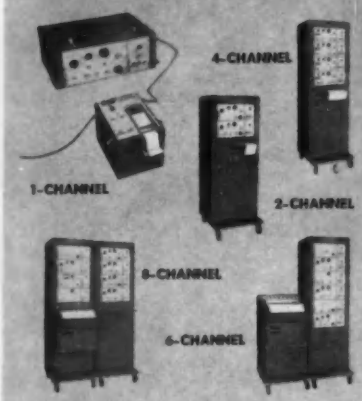
THIS new self-contained 8-channel oscillographic recording system, primarily for (but not limited to) analog computer recording, measures only 46½" x 27" x 22". In a single, space-saving mobile package, the user has a complete system for analog computer readout recording. Input cable connections are easily made at the top of the back panel. Eight groups of controls for the eight channels are conveniently located on the sloping top panel. Driver Amplifier chassis are easily withdrawn from the lower part of the console for inspection. Paper loading is quickly done from the top.

Features of the Model 158-5490 system include 0.1v/cm to 100v/cm sensitivity; over-all linearity of 0.25 mm over the entire 4 cm of the chart; drift less than 0.5 mm/hour; push-pull or single-ended input; miniaturized dual-channel DC amplifiers of improved current feedback design; 5 meg. input impedance each input lead to ground; true rectangular coordinate recording; nine chart speeds from 0.25 to 100 mm/sec. Frequency response is flat to 20 cps, down 3 db at 60 cps for all amplitudes to 4 cm peak to peak.

PRIMARILY FOR USE WITH ANALOG COMPUTERS

COMPLETE COMPACT SELF-CONTAINED

FAMOUS "150" SYSTEMS
. . . for all recording requirements



In laboratories, production testing facilities and field installations nationwide Sanborn 150 Series Oscillographic Recording Systems are proving their versatility and value. Users have a choice of basic systems ranging from 1 to 8 channels . . . "packaged" as portable units or in vertical mobile cabinets . . . and twelve interchangeable plug-in preamplifiers permitting rapid, economical changeover to new input requirements.

Sanborn will gladly furnish complete descriptive data on the new 158-5490 System and all "regular 150" systems, or engineering assistance on your recording problems, whenever you wish. Contact your Sanborn Representative, or write to

SANBORN COMPANY
INDUSTRIAL DIVISION
195 MASS. AVE., CAMBRIDGE 39, MASS.

World Airplane Records for Speed Altitude Distance

(*Continued from page* 71)

ordinate of the chart and "x" the absissa; "e" has the value of 2.73, "m" = the slope of the line divided by the scale value of "K," and "C" equals the value of "Y" when "x" is zero. It is interesting to note that all of the values for speed, altitude and distance arrange themselves as straight lines in which the slope varies with the period of development. The decreasing slope with time provides a good indication of the rate of progress with time. For comparison with the world speed records, the maximum speed of commercial airliners is shown on the same chart. It will be seen that these values also follow the same pattern. The values for the Lockheed Electra (Turboprop airplane) and the Douglas DC-8 and Boeing 707 Airliner (jet) are based on preliminary performance data released by these companies.

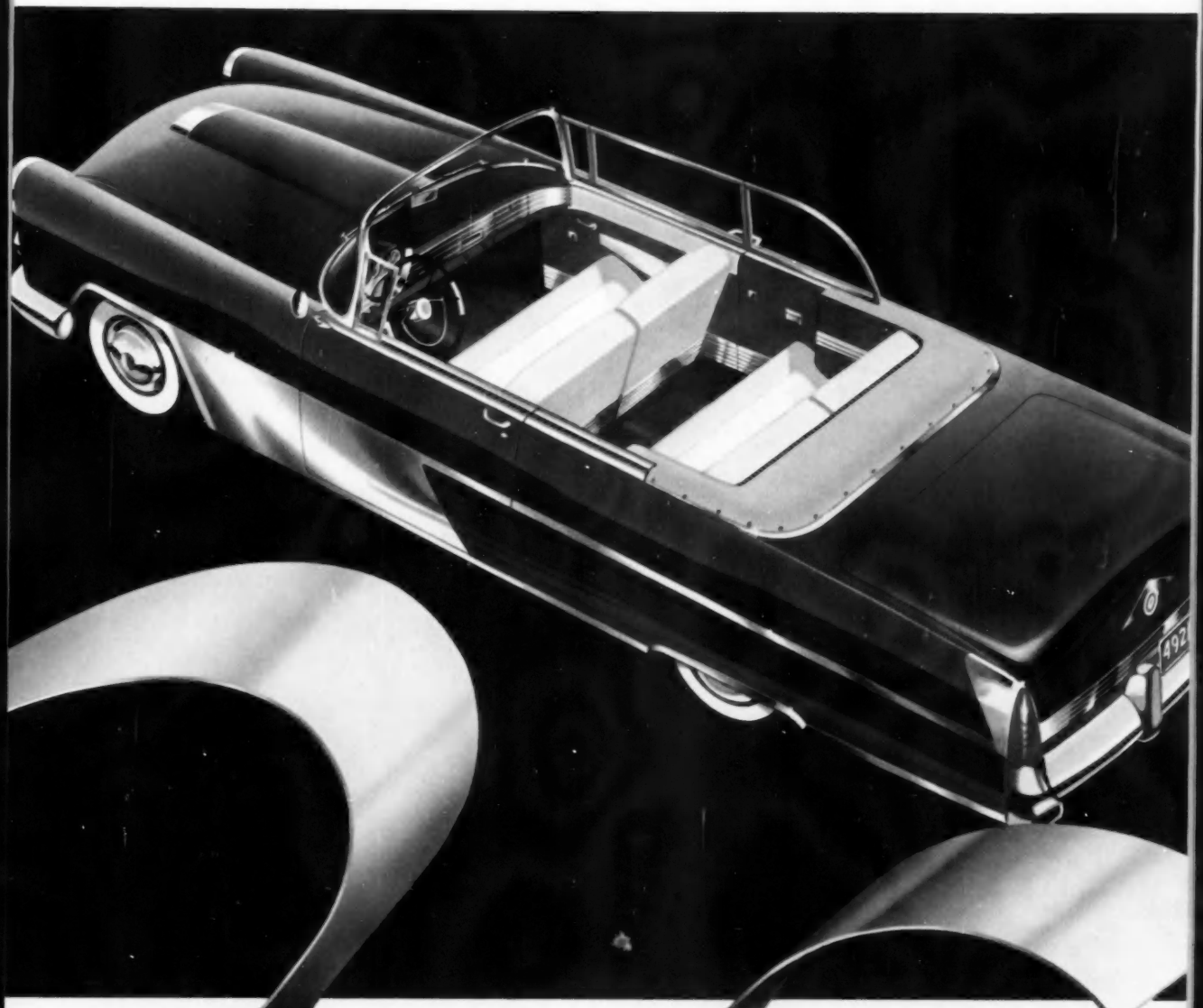
The progress of in the first 50 years of heavier-than-air flight has been tremendous. It is interesting to speculate on the next 50 years. How fast and how high will manned aircraft go and how soon will we solve the problems of temperatures encountered for travel at extremely high speeds together with practical power plants to achieve these speeds and altitudes. The sonic barrier has been conquered. The thermal barrier is next in line.

An NACA experimental missile, according to recent information, has flown over 7000 miles per hour, almost double the previous maximum speed. The ICBM will probably be about 100 ft long and about 14 to 16 ft in diameter. It will be capable of speeds in excess of 12,000 miles per hour, obtained by means of huge rocket-jet engines. Altitude will definitely be over 200 miles and the range in the order of 6000 miles. It will have to sustain temperatures, due to aerodynamic heating on re-entry into the atmosphere, between 8000 and 10,000 F and perhaps even higher. These are the problems on which scientists are working at a feverish rate and tremendous sums of money are being expended in the race to be first in this field.

EXECUTIVES READ
AUTOMOTIVE INDUSTRIES

the bright spots

in any automobile picture



FUNCTIONAL AND DECORATIVE TRIM OF

stainless steel

BRIGHTWORK of time-proved *stainless steel* sparkles invitingly on the car dealer's floor . . . shines as it serves, year after year . . . gleams like new when the car is old! For built-in luster that foils corrosion, plus super-strength to resist dents and scratches, design and specify STAINLESS STEEL . . . the quality metal that speeds acceptance of your cars—on *first sale and resale!*

Superior

stainless strip steel

Superior Steel

CORPORATION

CARNEGIE, PENNSYLVANIA

Keeps its dependability

The Westinghouse Weld-O-Timer*. . . with extra long-lived components

For instance, in the new Weld-O-Timer, 600-volt capacitors are used even though circuit voltage is only 150 volts. Relays, interchangeable between solenoid and firing control, are also of long-lasting construction. Each control panel element is rated for heavy-duty industrial work.

And you get instant protection from high operating heat with the snap-on Ignitron tube thermostat plus improved welder efficiency. Everything about this new resistance welding control means greater production, less down time, and more dependability. For all the facts, call your Westinghouse sales engineer. Or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21945

This new Westinghouse Ignitron tube protects from high operating heat and conserves cooling water. Inside shell of water jacket contacts copper strip on outer jacket. Thermostatic switch (circled) shuts off current if dangerous heat builds up.

*Trade-Mark

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

ENGINE TEST DEPARTMENT
Engines are automatically routed onto free lines feeding into the test stand area. They seek out empty test stands automatically, and if all the test stands are filled, engines circulate around the power and free system until a test stand is vacant.

Overhead Automation

OF MATERIALS MOVEMENT AND STORAGE

One of the largest manufacturers of automobiles achieved a high degree of automation in his engine plant by utilizing a Webb power and free conveyor system. A network of 14 conveyors, 8000 feet in length, ties all the various plant areas together into one automatically controlled system. Extending through engine assembly, test, repair and shipping, the conveyor system provides (1) on-the-conveyor assembly of engines, (2) mobile overhead storage, (3) on-conveyor testing, (4) live bank areas for work in process.

This Webb power and free conveyor system provides considerable flexibility in plant operation. It permits greater control in work flow, allows varying speeds between conveyors in the system, permits materials to be switched automatically onto free lines for stationary operations and storage, and simplifies transfer of loads between conveyors.

If you are looking for greater efficiency in your materials handling operations . . . if you are looking for additional floor space . . . for added profits from lowered production costs, contact your nearest Webb office. Write for Catalog No. 52.

OVERHEAD STORAGE BANK
Webb power and free systems provide for overhead storage of materials, leaving valuable floor space clear for production operations.

SINGLE CONTROL CONSOLE
This control console provides complete synchronization of the 14 conveyor lines. The entire system is displayed on the vertical panel. Calibrating dials on the console permit the changing of speed for conveyors in the system as desired.

Circle 143 on Reader Service Card

WEBB

JERVIS B. WEBB CO.

Specialists in Custom Conveyor Systems

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FACTORIES: DETROIT • ATLANTA • LOS ANGELES • HAMILTON, ONTARIO, CANADA • ENGLAND • FRANCE • AUSTRALIA

TDA® BRAKES

where you have equipment to control or stop...

THE VERSATILE NEW DLM BRAKE

by Timken-Detroit® can offer remarkable help!

Versatility! Flexibility! The revolutionary DLM will serve effectively with a variety of equipment. It has already proved its value as a control or parking brake, and is used extensively on trucks, buses, machinery, farm equipment, cranes, shovels, hoists, golf buggies, and lift trucks.

Highly Efficient! The DLM brake is basically a self-energizing two-shoe brake in which both shoes do the same amount of work—give equal forward and reverse torque output, regardless of drum rotation.

Simpler! Only 8 parts, with interchangeable shoes and springs. Lubrication is not required. No internal adjustment necessary. Enclosed design guards against entrance of foreign matter and requires only a minimum of maintenance.

Lighter! More Payload Advantages! Improved TDA design using lightweight fabricated steel shoes and brake supports saves many pounds over heavier, more costly brakes.

For additional information and expert consultation about your control or brake problems contact Timken-Detroit® Brake Division. Complete specifications on the DLM are available.

©1956 RS&A Company

For every industrial or automotive application where braking is required!

TDA plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

TIMKEN Detroit BRAKES
ROCKWELL SPRING AND AXLE COMPANY
Accepted TDA Standard

SHORTIES

About 110 million gal of antifreeze solutions were sold in 1955 to protect 60 million automobiles, trucks, and buses from winter freeze-up.

•

Farmers today spend over 4.5 times as much on motor vehicles and farm machinery as they did 30 years ago. In recent years, this expenditure alone has averaged better than $2 billion annually.

•

Rust costs the average American about $36 a year or a whopping $6 billion for the nation.

•

Funds expended by one airframe company for research and development increased from $537,000 in 1950 to $4 million in 1955, a gain of 793 per cent.

•

There are two and a half times as many motor vehicles on the Canadian highways today as there were 10 years ago.

•

The engineering colleges of the U. S. have experienced a net loss of three per cent of their professors to industry within a two-year period. This has come at a time when the engineering colleges need 1300 more teachers to carry the 1956-57 load.

•

Bomber and fighter aerial refueling operations of the Strategic Air Command have transferred enough fuel to fill 14,000 railroad tank cars.

•

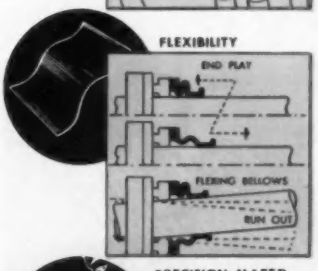
Jet planes of the Strategic Air Command have traveled the equivalent of 22,374 trips around the world.

•

There are 26,000 automobiles per 100,000 of population in the U. S., but only 93 in India. By the same token, there are 12,000 automobiles per 1000 square miles in the U. S. but only 250 in India.

JOHN CRANE

Shaft Seal Design With A Purpose!



POSITIVE DRIVE

This gives long seal life. Drive is transmitted through the driving band and washer driving notch which absorb all breakout and running torque. Damaging stresses on the bellows or flexible sealing member are eliminated. Slippage is also eliminated, thus protecting shaft or sleeve against galling.

FLEXIBILITY

Axial and radial misalignment problems are eliminated. Self-adjusting bellows or sealing head automatically compensates for shaft end play or run out. Minimum spring pressure is required for axial shaft movement and uniform spring pressure is maintained during radial shaft movement.

PRECISION MANUFACTURE

Leakproof performance is assured. Washer and seat surfaces are precision lapped to a perfect mate under a patented "John Crane" process.

A SEAL FOR EVERY SERVICE

All "John Crane" Seals are constructed to the particular service requirements . . . from hot or cold water to the most destructive acids, corrosives and gases . . . temperatures up to 1000°F. . . . pressures to 1200 psi. They can be furnished in types and sizes to meet practically any mechanical or dimensional condition.

Request Bulletin S-204-2. Containing full information on "John Crane" engineered shaft seals.

GET COMPLETE DETAILS

Crane Packing Co.,
6435 Oakton Street,
Morton Grove, Ill.
(Chicago Suburb)

In Canada:
Crane Packing Co.,
Ltd., Hamilton, Ont.

CRANE PACKING COMPANY

More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from July 30 to August 27, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AMERICAN MOTORS CORP., Detroit, Mich.
Station wagons—30 ea.—$42,900

AUTOMATIC TRANSPORTATION CO., Div. of Yale & Towne Mfg. Co., Chicago, Ill.
Truck, forklift, electric, 8,000 lb capacity—12 ea.—$66,395

THE BAKER RAULANG CO., Cleveland, Ohio
Truck, fork lift—6 ea.—$28,062

MAXIMUM PERFORMANCE
MINIMUM MAINTENANCE

Through advanced design and creative engineering, BORG & BECK has stepped up the capacity of its passenger car clutches without increasing their over-all dimensions. Compact, light in weight, precision built—for maximum performance, minimum maintenance.

for that vital spot *where power takes hold of the load*

BORG & BECK CLUTCH — THE STANDARD — Reg. U.S. Pat. Off.

BORG & BECK

DIVISION OF BORG-WARNER

Chicago 38, Illinois

BEECH AIRCRAFT CORP., Wichita, Kan.
Type L-23E airplanes—$490,413

CHRYSLER CORPORATION, Detroit, Mich.
Vehicle parts—1500 ea.—$30,060
Automotive spare parts—1244 ea.—$69,618

CHRYSLER CORP., Detroit Universal Div., Dearborn, Mich.
Vehicle parts—1857 ea.—$41,931

CLEMCO AERO PRODUCTS, INC., Compton, Calif.
20 experimental test vehicles—$68,496

CONTINENTAL MOTORS CORP., Detroit, Mich.
25½ hp. preproduction engines—job—$79,300

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Engine modification—various—$51,344

COOPER TIRE & RUBBER CO., Findlay, Ohio
Tire, 7.50 x 20—11,839 ea.—$306,274

DEMPSTER BROTHERS, INC., Knoxville, Tenn.
Truck, materials handling—3 ea.—$27,436

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Parts: For R5D spares—various—$34,243

ELASTIC STOP NUT CORP. OF AMERICA, Union, N. J.
Self-locking nut—3,200,000—$59,440

THE ELECTRIC AUTO LITE CO., Battery Div., Toledo, Ohio
Batteries—2196 ea.—$28,526

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Aircraft Div., Hagerstown, Md.
C-123B aircraft—$6,000,000

THE FIRESTONE TIRE & RUBBER CO., Akron, Ohio
Tire, 7.50 x 20—67,621 ea.—$1,572,188
Tank, fabric, collapsible—28 sets—$123,162

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—9 ea.—$14,097

GENERAL ELECTRIC COMPANY, Evendale, Ohio
Repair, overhaul and modification of J47 engines—job—$11,271,960

GENERAL MOTORS CORP., Aeroproducts Operations, Allison Div., Dayton, Ohio
Airplane spare parts—$52,484

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
Cover, flywheel assy.—165 ea.—$21,211
Servo, rear, transmission assy.—62 ea.—$19,772
Overhaul of J35 engines—job—$2,713,035

GENERAL MOTORS CORP., Delco Remy Div., Anderson, Ind.
Batteries, 12 volt—1804 ea.—$39,814

GENERAL MOTORS CORP., GMC Truck and Coach Div., Pontiac, Mich.
Vehicle parts—6810 ea.—$123,556

B. F. GOODRICH TIRE AND EQUIPMENT CO., Div. of B. F. Goodrich Co., Akron, Ohio
Tube, 9.00 x 20—6887 ea.—$29,269

THE GOODYEAR TIRE AND RUBBER CO., INC., Akron, Ohio
Wheel and brake assys.—various—$55,464
Brake linings—222,780 ea.—$314,342
Brake assys.—72 ea.—$48,406

(*Turn to page* 114, *please*)

REPORT FROM DU PONT:

Fuels, Lubricants and the New High Compression Ratios

Today's high compression car engines are hungry for high-octane fuels.

As a result, refiners are faced with increased costs. To help them evaluate high compression requirements and meet necessary standards economically, the Du Pont Petroleum Laboratory has completed a fuel-and-lubricant testing program with engines having compression ratios as high as 11:1.

Here is a brief résumé of the findings . . . From both laboratory and on-the-road testing, it was found that an engine with 11:1 C.R. could be operated under normal conditions —and free of combustion noise—on 100-O.N. fuel. The tests also showed that the engine design, fuel and lubricant all have a significant effect on the engine's performance. Therefore, to keep the octane requirements of high compression engines at a minimum, each of these three factors requires careful consideration.

New findings

One of the most significant findings of the tests is that high compression engines are not so critical on fuels and lubricants as was previously thought. For example, it was found that the 90% distilled point is not necessarily the criterion for measuring deposit harm of fuels. This means that refiners will have more latitude in blending the components for high compression fuels, and therefore, may be able to use more of their heavy ends in this type of fuel, without detrimental effects on engines.

Lubricants tested

The Laboratory found that multigrade oils were generally satisfactory in reducing deposit harm. A di-ester type synthetic lubricant, however, was found to be even better. This indicates that the octane requirements of high compression engines can be reduced by improvements in lubricants as well as in fuels.

Surface ignition

Even under the most adverse conditions, the tests showed surface ignition to be negligible at 9:1 C.R. At 11:1 C.R., it was much more prevalent indicating the need for careful selection of fuels and lubricants, as well as engine design.

A paper giving full details on this testing program was recently presented at the API Refining Meeting in Montreal. Just drop us a line if you would like a copy.

DU PONT
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LOS ANGELES 17—612 So. Flower St. ..... MAdison 5-1691
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USE OUR

PACKAGE DESIGN LABORATORY—OUR

ENGINEERS WILL WELCOME YOUR

REQUESTS FOR

SAMPLES OF CONTAINERS DESIGNED

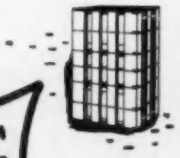
TO SHIP YOUR PRODUCT SAFELY.

REMEMBER—

OUR LABORATORY IS AVAILABLE AT

NO COST OR OBLIGATION—WE ARE

GLAD TO BE OF SERVICE TO YOU.



SHIPPING TRADE SUPERSTRONG MARK CONTAINERS REG. U.S. PAT. OFF.

Wirebound Boxes and Crates • Wooden Boxes and Crates
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1440 WEST 21st PLACE, CHICAGO 8, ILLINOIS

(*Continued from page* 112)

HESSEE CARRIAGE COMPANY, Kansas City, Mo.
Body, truck, light maintenance—404 ea. —$131,300

HOLLEY CARBURETOR COMPANY, Van Dyke, Mich.
Spare parts—8950 ea.—$46,988

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Ill.
Tractors—5 ea.—$105,023

THE KAMAN AIRCRAFT CORP., Bloomfield, Conn.
Design study for helicopters—$41,827

LOCKHEED AIRCRAFT SERVICE, INC., Ontario, Calif.
IRAN and modification of F-94 aircraft —277 ea.—$2,160,000
IRAN and modification of RC-121C/D aircraft—55 ea.—$600,000

THE LOFSTRAND COMPANY, Rockville, Md.
Trailer, pumper (fire), electric—156 ea. —$1,208,190

GLENN L. MARTIN COMPANY, Baltimore, Md.
Prototype and engineering services—$270,000

NORTH AMERICAN AVIATION, INC., Columbus, Ohio
F-100D aircraft—$39,713,624

PACIFIC TIRE & RUBBER CO., Oakland, Calif.
Tire, 7.50 x 20—2000 ea.—$55,640

JOHN REINER & CO., Long Island City, N. Y.
Generator set, 5KW—3567 ea.—$3,716,-814

ROBBINS TIRE & RUBBER CO., INC., Tuscumbia, Ala.
Tire, 7.50 x 20—46,350 ea.—$124,218

ROHR AIRCRAFT CORP., Chula Vista, Calif.
Parts AJ aircraft—various—$268,452

RUSSELL, BURDSALL & WARD BOLT AND NUT CO., Port Chester, N. Y.
Nut, plain, hexagon—3,605,400 ea.—$28,-453

RYAN AERONAUTICAL CO., San Diego, Calif.
Q-2A drones—91 ea.—$1,190,000

STEWART STEEL PRODUCTS, INC., Brooklyn, N. Y.
Handling trucks—7 ea.—$54,880

STEWART - WARNER CORP., South Wind Div., Indianapolis, Ind.
Blower assy., combustion air—2184—$57,414

STUDEBAKER - PACKARD CORP., Detroit, Mich.
Trucks, 2½ ton—141 ea.—$33,984

TEXTRON, INC., Homelite Div., Port Chester, N. Y.
Generator set, 0.15KW—102 ea.—$78,883

THOMPSON PRODUCTS, INC., Cleveland, Ohio
Overhaul of turbo alternator drive—job—$454,500

UNITED AIRCRAFT CORP., Sikorsky Aircraft, Stratford, Conn.
H-19D utility helicopters—$2,100,000

VICKERS, INC., Detroit, Mich.
Hydraulic pumps—36 ea.—$461,440

WILLYS MOTORS, INC., Toledo, Ohio
Trucks—481 ea.—$777,791
Ambulances—15 ea.—$37,362

WOLVERINE DIESEL POWER CO., Detroit, Mich.
Generator set, 7.5 KW—227 ea.—$903,-450

THE YALE & TOWNE MFG. CO., Yale Materials Handling Div., Phila., Pa.
Light trucks—12 ea.—$44,275
Truck, Fork Lift—11 ea.—$66,079

"SWITCH!" said Ostuco

. . . and savings were surprising!

Pleasant surprise, too! Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc. Lancaster, Pa., was machining OSTUCO seamless tubing to make a clutch release bearing collar used as original and replacement equipment. Results were fine!

Then word came from OSTUCO, recommending a switch to OSTUCO's newly developed NP-60, tubing specially processed for machineability. Cost was slightly higher, but BCA and OSTUCO engineers predicted the savings would justify the change.

they switched . . .

. . . and they SAVED!

	Regular	Specially Processed NP-60
Production per 8 hour shift (units)	675	840
Production time per 1000 units (hours) . . .	12.35	10.03
Total Labor per 1000 units (man-hours) . .	13.09	10.63

Besides the savings, Bearings Company of America was pleased with the better finish of the new part. They point out that the collar in photo above "shows the finish as it comes directly off the machine."

It happens this way often enough to warrant checking with OSTUCO about your tubing applications and production problems. Contact your nearest OSTUCO Sales Engineer or write direct to the Shelby factory —there's no obligation!

OSTUCO TUBING

SEAMLESS AND ELECTRIC RESISTANCE WELDED STEEL TUBING—Fabricating and Forging

OHIO SEAMLESS TUBE DIVISION
of Copperweld Steel Company • **SHELBY, OHIO**
Birthplace of the Seamless Steel Tube Industry in America

SALES OFFICES: BIRMINGHAM • CHARLOTTE • CHICAGO (Oak Park) CLEVELAND • DAYTON • DENVER • DETROIT (Ferndale) HOUSTON • LOS ANGELES (Beverly Hills) • MOLINE NEW YORK • NORTH KANSAS CITY • PHILADELPHIA PITTSBURGH • RICHMOND • ROCHESTER • ST. LOUIS ST. PAUL • SALT LAKE CITY • SEATTLE • TULSA • WICHITA

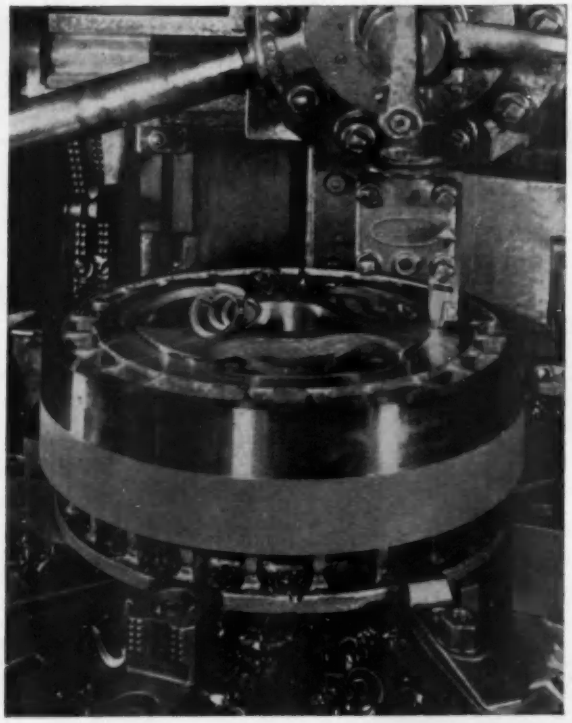
CANADA, RAILWAY & POWER ENGR. CORP., LTD.
EXPORT: COPPERWELD STEEL INTERNATIONAL COMPANY
225 Broadway, New York 7, New York

Be sure to Visit Our Booth #311 at the A.S.M. Metal Show in Cleveland.

By using "Equivalent Grade" Charts when buying carbides...

YOU MAY LOSE THOUSANDS BY SAVING A FEW

Relying on "Equivalent Grade" Charts can lead to purchasing on low initial cost alone... whereas production ability really determines a tool's worth



TESTS ON 1045 CAST STEEL by a Chicago machine manufacturer demonstrate tremendous differences in carbides' production abilities. With Grade "X," as many as 16 clamp-on-type carbide inserts were required for a single facing cut on this power shovel clutch and brake drum.

A single Grade "Y" insert (Carboloy Grade 370) took nine cuts without showing any appreciable wear . . . under identical operating conditions. Result: over-all tooling cost reduced 90% on the 15-piece comparative run.

THE SO-CALLED "Equivalent Grade" Charts may be costing your plant literally thousands of dollars a year . . . in lost production, wasted manpower, higher machining expense.

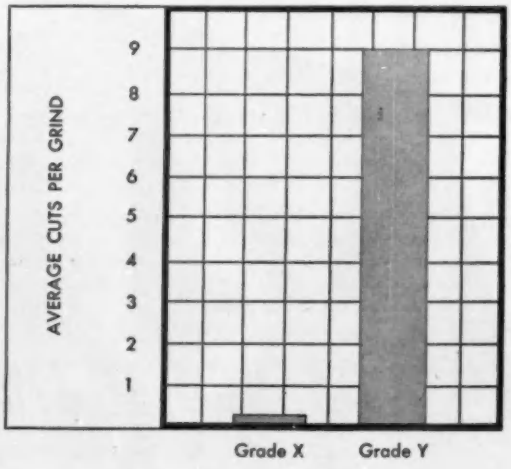
These charts conceal the tremendous differences in production abilities that always exist among various "equivalent" carbide grades. Worse, they tend to justify using initial cost, rather than over-all performance, as the basic criterion for purchasing carbide tools.

In-plant tests prove production abilities vary

What will happen to production if carbides are selected on the basis of the "Equivalent Grade" Charts? The case history at left gives the answer. It is typical of hundreds in the Carboloy files.

The average "Equivalent Grade" Chart lists no fewer than 14 different grades for this job . . . and implies that they can be used interchangeably. But in-plant comparative tests proved that no two grades could provide the same results.

When Grade "X" was selected, for example, an average of four inserts were required to take a single facing cut. But when Grade "Y" was used, a single carbide insert produced nine cuts . . . a tool life increase of 36 to 1 (Graph No. 1).



Graph No. 1—Production Ability Comparisons

OF PRODUCTION DOLLARS TOOLING PENNIES

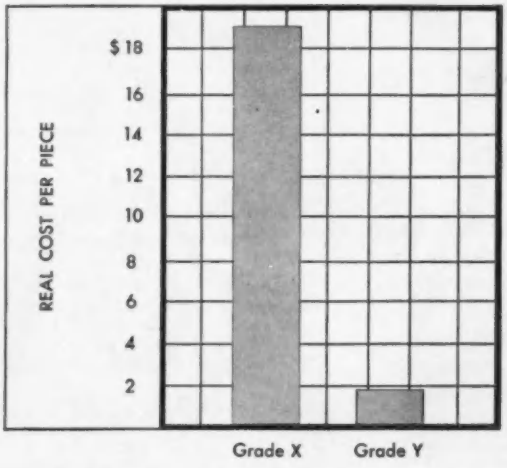
Why the tremendous difference? Grade "Y" simply had more production ability. It brought far more production per grind, reduced downtime, and drastically lowered grinding costs. Yet nothing in the "Equivalent Grade" Charts could predict this.

Initial Costs vs. Real Costs

Because "Equivalent Grade" Charts imply that all grades perform alike, they make it logical to assume that low initial cost is the most important consideration. A little arithmetic will prove that the *real* cost of carbides bears no relation to initial cost.

With Grade "X," total tooling cost for 15 pieces was $285.68 (16 tools at $13.04 each; 44 regrinds at $.41 each; 59 tool changes at $1.00 each). Machining cost per piece was $19.05.

Grade "Y" inserts cost $1.30 more initially. But total cost for 15 pieces was just $29.68 (2 tools at $14.34 each; 1 tool change at $1.00; nothing for regrinds). Real cost per piece with Grade "Y" was $1.98 . . . a reduction of 90%!



Graph No. 2—Real Cost Comparisons

Now add to these savings in tool cost, downtime, and grinding charges, the equally important savings from lower total manpower costs and reduced inventories. Then multiply the total by the number of jobs in the plant where similar cost reductions can be realized. You'll see why a few pennies more per tool is a small price to pay for carbides that can save you so much.

Cost-conscious purchasers specify Carboloy Extra-Performance Carbides

Grade "Y" in the preceding example is Carboloy Grade 370. It is one of three new, extra-performance steel-cutting carbides. These three grades – 330, 350, and 370 – cost slightly more initially because they are made by a unique and more costly process. But their performance is so superior to conventional carbides that there is no classification on the "Equivalent Grade" Charts to fit them.

Because of their extra production ability, these carbides easily show up the glaring shortcomings of the "Equivalent Grade" Charts. But even on conventional grades, actual tool comparisons prove the charts cannot be relied upon.

That's why we make this suggestion: Have comparative tests run in your own plant, on your own jobs. When the results are in, you too may find that your plant can save thousands of dollars a year simply by switching to carbides with greater production abilities.

With so much money at stake on every carbide tool used in your plant, you can easily see why the phrase "or equivalent" is rapidly becoming obsolete on tool specifications. These tests prove it really pays to specify *Carboloy* cemented carbides – by name.

If you would like a more detailed discussion of the whole subject of Initial Costs vs. Real Costs, and the fallacies of the so-called "Equivalent Grade" Charts, write today for a Carbide Sales Engineer to call on you. *Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Blvd., Detroit 32, Michigan.*

"Carboloy" is a trademark of General Electric Company

CARBOLOY

CEMENTED CARBIDES

11151 E. 8 Mile Blvd., Detroit 32, Michigan

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to July 11, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the August 15 issue, page 160, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from July 12 to August 8, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AEROJET-GENERAL CORP., Azusa, Calif.
Research and development—$950,000 (40)

BEECH AIRCRAFT CORP., Wichita, Kan.
Military aircraft—$69,983 (65)

BELL AIRCRAFT CORP., Wheatfield, N. Y.
Military aircraft—$580,000 (60)

BENDIX AVIATION CORP., Hamilton Div., Hamilton, Ohio
Jet engine parts—$194,814 (65)

BOEING AIRPLANE COMPANY, Seattle, Wash.
Military aircraft—$4,994,462 (185)

THE DENISON ENGINEERING CO., Subsidiary of American Brake Shoe Co., Columbus, Ohio
Military aircraft—$373,372 (40)

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Military aircraft—$2,592,375 (65)

DYNA-EMPIRE, INC., Garden City, L. I., N. Y.
Jet engine parts—$233,385 (50)

EX-CELL-O CORP., Detroit, Mich.
Military aircraft parts—$373,406 (65)

FAIRCHILD ENGINE & AIRPLANE CORP., Fairfield Engine Div., Long Island, N. Y.
Military aircraft engines—$1,388,938 (65)

FENWAL INCORPORATED, Ashland, Mass.
Military aircraft parts—$49,719 (70)

GOODYEAR AIRCRAFT CORP., Litchfield Park, Ariz.
Aircraft parts—$195,696 (65)

GOODYEAR AIRCRAFT CORP., Akron, Ohio
Military aircraft parts—$429,990 (65)

THE GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Research and development—$1,663,187 (65)

LOCKHEED AIRCRAFT CORP., Marietta, Ga.
Military aircraft—$8,553,646 (185)

MAGNUS TOOL & DIE CO., Mountainside, N. J.
Military aircraft parts—$258,686 (50)

THE GLENN L. MARTIN COMPANY, Baltimore, Md.
Military aircraft—$232,985 (65)

NARMCO MANUFACTURING CO., San Diego, Calif.
Military aircraft parts—$303,471 (115)

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Military aircraft—$95,000 (65)

REACTION MOTORS, INC., Morris County, N. J.
Research and development—$558,000 (70)

RYAN AERONAUTICAL CO., San Diego, Calif.
Military aircraft—$35,300 (60)

SUNDSTRAND MACHINE TOOL CO., Rockford, Ill.
Aircraft engine parts—$557,000 (45)

SURFACE COMBUSTION CORP., Janitrol Aircraft - Automotive Div., Columbus, Ohio
Research and development—$375,000 (60)

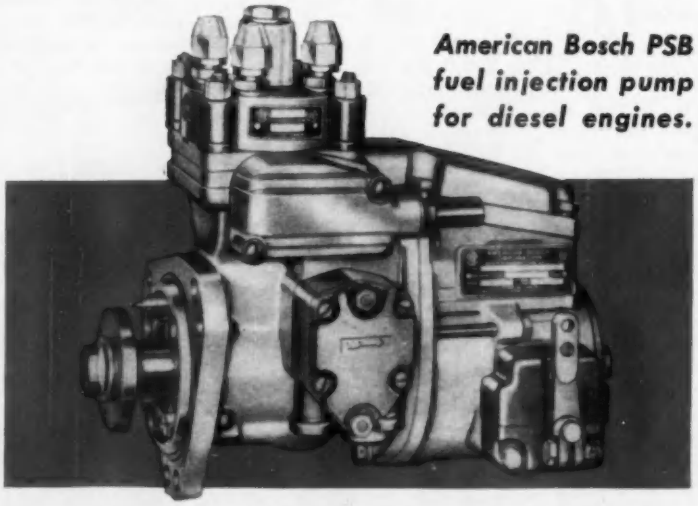
TEMCO AIRCRAFT CORP., Garland, Texas
Military aircraft subassemblies—$36,200 (60)

UNITED AIRCRAFT CORP., Windsor Locks, Conn.
Military aircraft parts—$252,900 (65)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Jet engines for military aircraft—$302,000 (65)

UNITED STATES RUBBER CO., Detroit, Mich.
Research and development—$760,170 (65)

THE UNITED TOOL AND DIE CO., West Hartford, Conn.
Military aircraft parts—$91,348 (70)



American Bosch PSB fuel injection pump for diesel engines.

Unmatched for service and performance . . .

That's the record of more than 100,000 American Bosch PSB fuel injection pumps now in service—some for as long as five years. The PSB has many features—simple rugged construction, fewer parts, accurate fuel metering and distribution, positive governor control. Easily replaceable hydraulic head permits quick field servicing. All combine to assure top engine performance and economy of operation, long trouble-free life and *low* maintenance expense.

Every American Bosch fuel injection product is backed by an established and growing system of authorized service agencies, fully equipped and staffed with trained personnel to provide quick, efficient repair service.

AMERICAN BOSCH

AMERICAN BOSCH
Division of
American Bosch Arma Corporation
Springfield 7, Mass., U. S. A.

PICK UP

HAUL

DUMP

three Steps to Better* Waste Disposal

with B-W LOAD LUGGER® SYSTEM

*** EASIER · FASTER · MORE ECONOMICAL**

Conventional methods of handling spent materials, scrap, rubbish and other plant waste take a lot of time, work, manpower and equipment. A costly, inefficient operation at best.

But with Borg-Warner's Load Lugger System, waste disposal is easy, fast, economical. One Load Lugger equipped truck, plus detachable Load Lugger containers, does the work of several conventional trucks. That greatly reduces investment in equipment, cuts manpower requirements, lowers operating and maintenance costs.

With specially designed containers, the Load Lugger System handles all types of materials—solids, liquids, gases. Hauls from 1½ to 14 cubic yards of material. Takes loads to 18,000 pounds.

What's more, the Load Lugger can be used to self-load and haul heavy equipment, pipe or other long or bulky pieces. Flat bed hoist bodies mount on any truck chassis of suitable capacity, with controls installed in cab for easy, one-man operation.

A product of B-W's Ingersoll Kalamazoo Division, the Load Lugger System is another typical example of Borg-Warner's "design it better—make it better" tradition. In this way, with hundreds of products, Borg-Warner serves American industry every day.

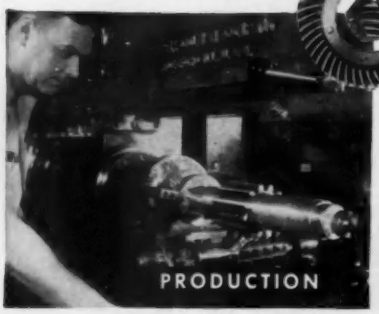
Almost every American benefits every day from the products of

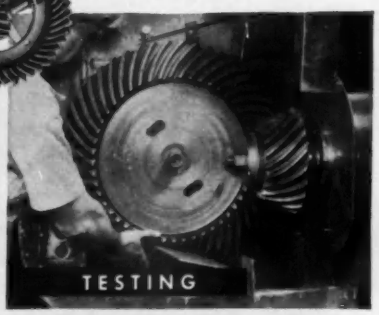
BORG-WARNER

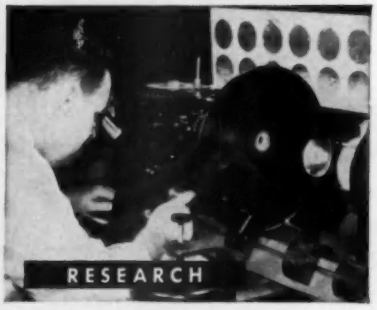
ENGINEERING B-W PRODUCTION

THESE UNITS FORM BORG-WARNER, *Executive Offices, 310 S. Michigan Ave., Chicago.* DIVISIONS: ATKINS SAW • BORG & BECK • BYRON JACKSON CALUMET STEEL • DETROIT GEAR • FRANKLIN STEEL • HYDRALINE PRODUCTS • INGERSOLL CONDITIONED AIR • INGERSOLL KALAMAZOO • INGERSOLL PRODUCTS • INGERSOLL STEEL • LONG MANUFACTURING • MARBON CHEMICAL • MARVEL-SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT NORGE • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WOOSTER DIVISION YORK • SUBSIDIARIES: B-W ACCEPTANCE CORP. • BORG-WARNER INTERNATIONAL • BORG-WARNER, LTD. • BORG-WARNER SERVICE PARTS • LONG MFG., LTD. MORSE CHAIN • MORSE CHAIN OF CANADA, LTD. • REFLECTAL CORP. • WARNER GEAR, LTD. • WESTON HYDRAULICS, LTD.

"FAIRFIELD for FINE GEARS"







WHAT **FAIRFIELD**

Experience MEANS TO YOU

Experience is the "plus value" that goes into every Fairfield gear *at no extra cost.* It is your assurance of dependable gear performance combined with the utmost in production economy. By specializing exclusively in "Fine Gears Made to Order" for more than thirty-five years, Fairfield has become one of America's largest independent producers of these parts. This is why many makers of Construction Machinery . . . Agricultural Implements . . . Machine Tools . . . Material Handling Equipment . . . Trucks, Tractors, and Buses now regularly depend on Fairfield to meet their requirements.

Fairfield's facilities are unexcelled. Here, in a new and ultra-modern plant you will find a complete metallurgical department, batteries of the most modern machines, testing laboratories, latest heat treating equipment—all operated by skilled craftsmen working under expert engineering supervision. *For the Best in Gears, Specify Fairfield!*

FAIRFIELD
MANUFACTURING CO.

2303
S. Concord Rd.

Lafayette,
Indiana

High Purity Aluminum

(*Continued from page* 100)

trade is type 5. This material has a tensile strength from 10,000 psi in the soft condition to 27,000 psi in the hard state. Yield strength (0.2 per cent) ranges from 2800 psi to 25,800 psi under the same conditions.

There is nothing new, and, therefore, nothing secret about the manner in which the material is produced. High purity aluminum is made by the triple layer electrolytic refining process which requires about two to three times more electrical power than conventional aluminum processing. Raw material is basically scrap aluminum with a high copper content.

One of the major problems encountered in the manufacture of Lurium alloys is the close control necessary during fabrication. Since the high luster after anodizing is dependent upon retaining the high purity, care must be taken to avoid the pick-up of foreign matter. Even Lurium scrap, when remelted, picks up sufficient impurities to make it unsuitable for re-use with prime metal. Because of their high purity, these alloys have a greater tendency toward grain growth. Therefore, careful control is necessary throughout all manufacturing operations in order to insure a fine grain structure in the finished shape. The highest quality finish and highest reflectivity after anodizing will be obtained with the finest grain material possible. Therefore, it is advisable to begin with the hardest temper which can be successfully fabricated. Annealing operations should be avoided; though when necessary to anneal, the temperature and time should be closely controlled in order to avoid coarse grain.

The material is available in sheet and strip within the thickness range of 0.008 in. and 0.50 in., as well as all commercial forms of bar, rod, tubing, circles, and extruded shapes.

Corrosion resistance of the high purity aluminum is greater than that of EC grade aluminum, according to a recent series of tests made abroad. The loss by weight for non-anodized Lurium in a 3.7 per cent aqueous solution of hydrochloric acid is at the rate of only 2.03 milligrams per square decimeter per day.

EXECUTIVES READ
AUTOMOTIVE INDUSTRIES

YEAR AFTER YEAR, MODEL AFTER MODEL

MORE THAN ONE OUT OF THREE CARS

ARE EQUIPPED WITH MUSKEGON PISTON RINGS

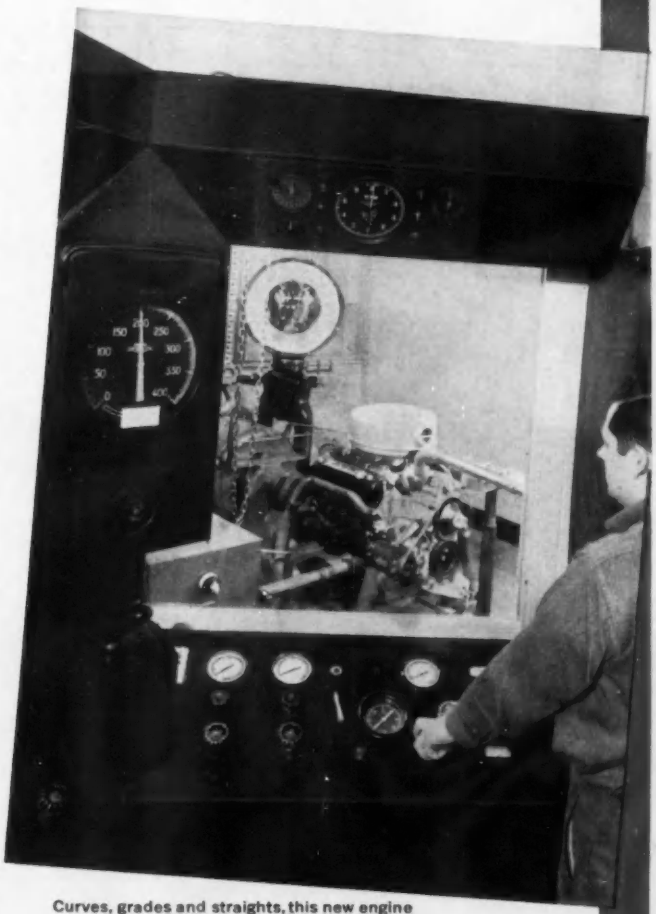
BECAUSE

MUSKEGON

HAS WHAT IT TAKES
IN NEW IDEAS FOR
TOMORROW'S ENGINES

Chances are, more than one out of every three new cars you point out will have Muskegon Piston Rings! Long before the birth of that car, Muskegon engineers were coordinating ring design and development with the engine builder — exchanging ideas and information that would not only mean better performance, but also economical and simplified maintenance.

Muskegon's role in ring development is a current, active enterprise, not hindered by production limitations or lack of machine facilities. That's one reason why Muskegon rings are installed on more than one out of three automobiles. It takes engineering, complete modern production facilities, and the ability to deliver in volume . . . on time . . . to compile this record. Isn't it time you checked with Muskegon for your ring needs?



Curves, grades and straights, this new engine never leaves its soundproof test room at Muskegon yet experiences all of these driving conditions. "Motor run" test rooms like this enable Muskegon engineers to anticipate ring requirements . . . test ring designs.

No matter what the design of the individual rings needed to fill the grooves of your piston, rely on Muskegon as your source.

MUSKEGON
Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

DETROIT OFFICE:
521 New Center Building
Telephone: TRinity 2-2113

Since 1921... The engine builders' source!

ON OUR WASHINGTON WIRE

Another boost in Government spending for defense is expected. Pentagon calculates that higher steel prices alone will add as much as an extra $35 million to its costs. In addition, the price tags on machine tools are being marked up. In short, Congress next year may have to appropriate nearly $1 billion more just to keep defense at its present strength.

Possibility of tax cuts in 1957 has dimmed slightly. Cost of running the country is increasing as fast as high level economic activity puts extra money in Government coffers.

Congress is expected to prod Defense Dept. again into making further progress in standardization of the products it buys. Pentagon is now in its seventh year of fussing over a basic Army-Navy-Air Force supply catalog.

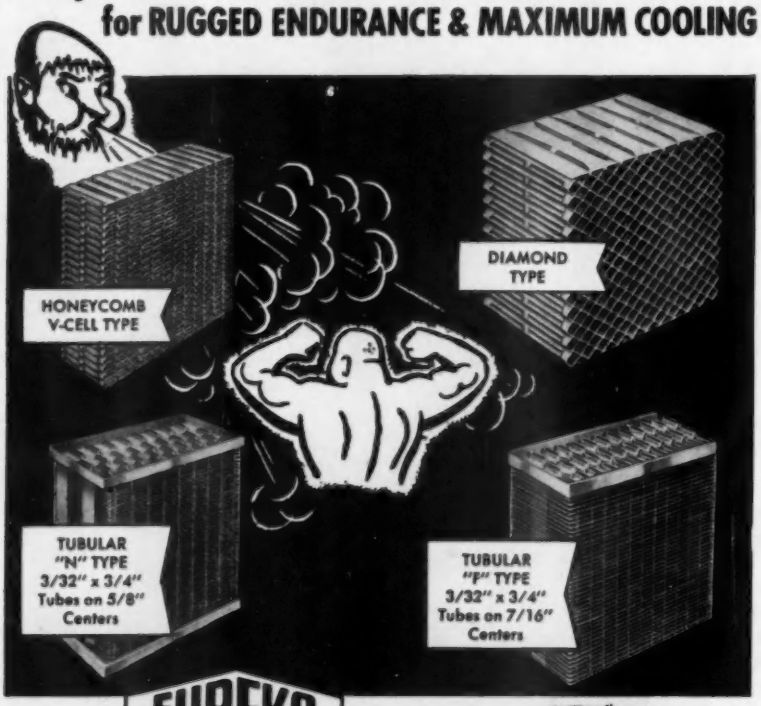
Federal Civil Defense Administration has announced publication of a pamphlet designed to show important steps that management and labor can take to protect personnel, plants and equipment against attack by an enemy. It is entitled "Ten Steps to Industrial Survival."

Commerce Dept. states that the economy rose to another record in the second quarter. Gross national product—the nation's total output of goods and services—reached a seasonally adjusted annual rate of $408.3 billion in the April-June months.

Top defense and mobilization officials see little possibility now of a new aluminum expansion goal. They say that the already attained defense capacity of 1.75 million tons of aluminum was established as necessary in case of an emergency.

Government has ordered a speed-up in its studies of defense expansion goals. Final decisions are expected within the next few weeks on renewed offerings of fast amortization for certain defense industries.

Depend on EUREKA RADIATORS
for RUGGED ENDURANCE & MAXIMUM COOLING



EUREKA

OVER 30 YEARS OF SPECIALIZATION

For over 30 years, EUREKA Cores and Radiators have served the automotive industry with utmost dependability. Our facilities, equipment, and personnel are available for your needs. We welcome the opportunity of integrating our specialized skills with your needs to help you achieve a well-planned production schedule.

What are your requirements? We can build Radiators to your order in any type, to any size or shape. Send us your blueprints for prompt quotations!

EUREKA RADIATORS AND CORES
for CARS, TRUCKS, TRACTORS and SPECIAL APPLICATIONS.

AUTO RADIATOR Manufacturing Co.
Guaranteed Radiator Cores Since 1915
2901-17 INDIANA AVE. • CHICAGO 16, ILLINOIS

FIRST in 1925 with stationary vane, centrifugal-type air cleaner

FIRST in 1929 with oil-wetted-type air cleaner

NOW-FIRST AGAIN with a new development that takes less underhood space, yet gives full oil-bath-cleaner life!

AC's laboratory on wheels can be at your plant in a matter of hours. Its staff of AC engineers will work closely with you to develop air cleaner and carburetor intake silencer combinations that match the exact requirements of each new engine.

Tape recordings of intake noises are made in the mobile laboratory. They are then played back and metal forming equipment permits the on-the-spot development of an intake silencer tailored perfectly to the new engine.

Call any one of the AC offices. Our facilities, skill and experience can be of great assistance in development work in your shop. Let AC ingenuity work for you.

AC QUALITY PRODUCTS

AC SPARK PLUG

THE ELECTRONICS DIVISION OF GENERAL MOTORS

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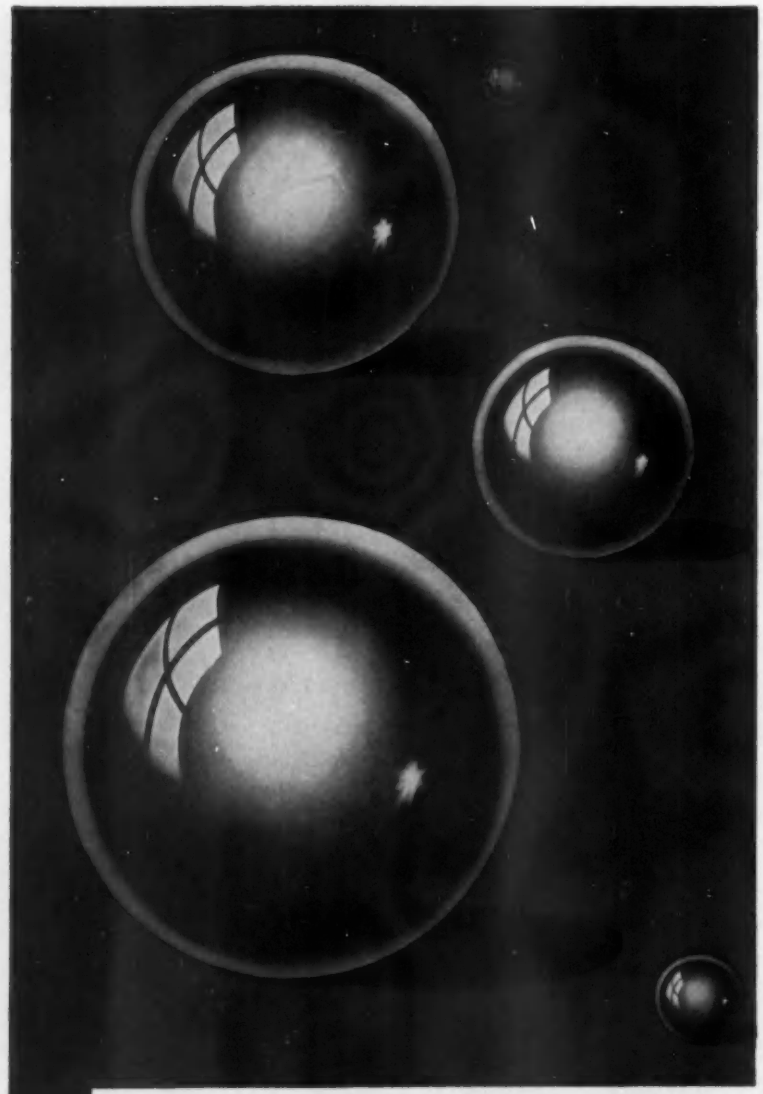
ADAPTERS (DRIVE) • AIR CLEANERS • AIR CLEANERS AND SILENCERS (COMBINATION) • AMMETERS • BREATHERS (CRANKCASE) • CAPS (RADIATOR PRESSURE) • FLEXIBLE SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM BOOSTER PUMPS (COMBINATION) • FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—AIR (PRESSURE) • GAUGES—GASOLINE • GAUGES—OIL (PRESSURE) • GAUGES—TEMPERATURE (WATER, OIL) • OIL FILTERS (LUBE) • PANELS (INSTRUMENT) • RECIPROCATING VACUUM PUMPS • ROTARY VACUUM PUMPS • SPARK PLUGS • SPEEDOMETERS • TACHOMETERS • TERMINALS (IGNITION WIRE) • VALVES (CRANKCASE VENTILATION)



AIRBRIEFS

(*Continued from page* 96)

generally employed over the ocean to locate any unidentified aircraft approaching the North American Continent.

Airborne Radar Beacon Finds Tanker Planes

A new high powered airborne radar beacon using a coded signal now insures that fuel-hungry Air Force planes will locate the tanker aircraft for mid-air refueling. Developed jointly by the U. S. aircraft industry and the USAF, the radar device enables long-range military aircraft to locate each other and pinpoint the exact position in space of tanker planes, regardless of darkness or weather.

This assured mid-air refueling can triple the effective reach of USAF's long-range aircraft, as well as extend the operational range of many other airborne missions.

Utility Aircraft Shipments

During the first seven months of 1956, more than 4000 planes of utility and executive aircrafts were shipped by seven U. S. personal plane manufacturers.

The total manufacturer's net billing price for these aircraft amounted to $62,028,000. Highest on the list was 859 Cessna model 172 aircraft. Next highest were 711 Piper Pacer and Tri Pacer airplanes. Among the shipment of twin engine executive aircraft was 240 Piper Apache's. Also included were 82 Beech Twin Bonanzas and 81 Aero Design Commanders.

It is interesting to note that this category of aircraft fly three times as many hours as the commercial U. S. airlines. Of the total U. S. active civil air fleet of 60,400 planes, the utility and executive aircraft account for all but 1500 aircraft which are used by the scheduled airlines.

The Flying Tigers Air Cargo, Inc.

The Flying Tigers, one of the oldest and largest of the all-cargo carriers, has purchased stock in Air Cargo, Inc. Air Cargo operates a ground service organization for the scheduled airlines in connection with their transportation of property, particularly freight. The Flying Tigers

(*Turn to page* 128, *please*)

How UNIONMELT Welding
Makes Tough Parts Tougher . . . Faster

UNIONMELT welding produces deep penetrating welds at top speeds, and is improving the production and quality of many parts used in rugged earth-moving equipment.

A 24 in. porosity-free circumferential seam, made by UNIONMELT welding in 62 sec., has eliminated oil leakage in sealed track rollers. Welds are made in 85 in. long track roller frames in only 5 minutes.

Another UNIONMELT welding setup used in the production of tractor wheels, makes two top-quality welds in one operation . . . A weld is made in a wheel hub at the same time the hub is welded to a 27 in. diameter rim.

UNIONMELT welding is particularly efficient in the fabrication of heavy materials because it—

- **Joins metal of any thickness**—in multiple passes. Metals up to 3 in. thick can be joined in one pass.
- **Means greater economy**—uses large diameter, low cost wire.
- **Uses a.c., d.c., or c.p. power supply**—with c.p. (constant potential) voltage is unchanged throughout welding—operations are fast and efficient.

Start saving now with UNIONMELT welding . . . Call your local LINDE representative for more information, and ask for a copy of Form 7942-A, "Modern Methods of Joining Metals."

UNIONMELT welding completes a contour weld in a bulldozer C-frame in an average speed of 17 in. per minute.

UNIONMELT welding eliminates leakage. A 24 in. circumference weld made in 62 sec. seals these grease-filled track rollers.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

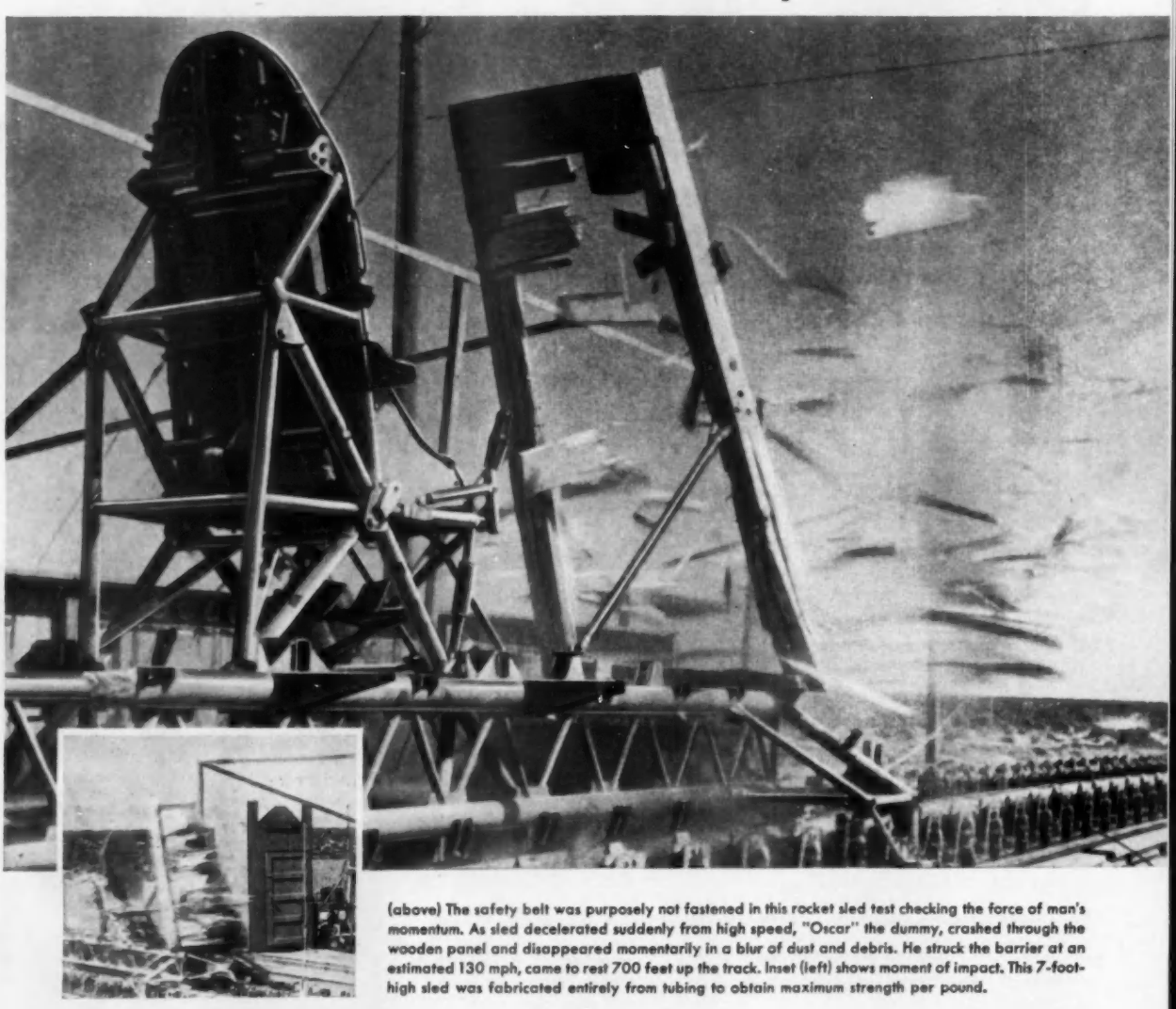
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

WHEN IT'S *MOVING* . . . MAKE IT TUBING

Pound for Pound, Tubular



(above) The safety belt was purposely not fastened in this rocket sled test checking the force of man's momentum. As sled decelerated suddenly from high speed, "Oscar" the dummy, crashed through the wooden panel and disappeared momentarily in a blur of dust and debris. He struck the barrier at an estimated 130 mph, came to rest 700 feet up the track. Inset (left) shows moment of impact. This 7-foot-high sled was fabricated entirely from tubing to obtain maximum strength per pound.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

Construction is STRONGEST!

Where strength is an important requirement—such as this rocket sled application (left) for deceleration tests—manufacturers choose tubing for basic construction. They know that at any given weight, tubing is strongest of all mechanical shapes . . . as a beam... in torsion... under compressive loads.

And through many years of good experience, structural fabricators know that—dollar for dollar—Republic ELECTRUNITE® Steel Mechanical Tubing is their best buy. The original electric resistance welded tube, ELECTRUNITE is well-known for both quality and performance. It's available in a wide variety of sizes, gages, and shapes . . . in both carbon and stainless steel.

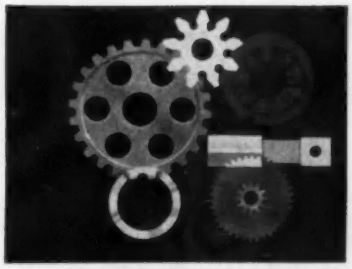
Predictable characteristics are assured because ELECTRUNITE tubing is made of Republic steel, to rigid Republic standards—each step carefully controlled from ore to finished product. Though produced in great volume, every length is consistently uniform, foot to foot, shipment to shipment. Wall thickness is uniform and so is concentricity. Surfaces are free from scratches and pit marks. It offers uniform response to heat treatment. It is easy to fabricate . . . often eliminates some costly fabricating or machining operation.

If you have a product that must be strong, safe and lightweight, investigate Republic ELECTRUNITE Steel Tubing. Republic's engineers can help you design it into your products or processes—economically and profitably.

Mail coupon below for all facts.

MORE REPUBLIC PRODUCTS MADE FOR MOVEMENT:

LIGHTWEIGHT ARMOR OF STAINLESS STEEL makes it possible for the Fruehauf Trailer Company's shiny new Volume Van to move a 35% bigger pay load. Stainless steel's exceptionally high strength-to-weight ratio permits the use of thinner, lighter sections—without loss of strength or sacrifice in safety. And where corrosion-resistance is important, stainless steel is ideal. We are glad to offer the services of our metallurgical and engineering departments. Contact nearest Republic office.



SMALL PARTS CAN OFTEN BE MADE FASTER, MORE UNIFORM—and at less cost using Republic Iron Powder. Complicated shapes, difficult to produce economically by conventional means, are easy to make by this new method. Republic metallurgists and engineers, with a thorough knowledge of all types of metals, can help you determine iron powder's suitability to your parts production. This service is available without cost or obligation. Just mail coupon.

WITHSTANDING ENORMOUS STRESSES AND STRAINS are all in a day's work for the track pins and dead axle shaft on this giant Oliver "OC-18" Industrial Crawler Tractor. Republic Cold Finished Steels at these vital points absorb tremendous punishment—yet continue to provide unfailing service. In countless other industrial applications, Republic Cold Finished Steels can give you the performance you want. Contact your local Republic Office or mail coupon for facts.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
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3106 East 45th Street
Cleveland 27, Ohio

Please send me more information on:

- ☐ ELECTRUNITE Mechanical Tubing
- ☐ ENDURO® Stainless Steel Intended Use_____
- ☐ Iron Powder ☐ Titanium
- ☐ Have a Metallurgist call

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

AIRBRIEFS

(*Continued from page* 124)

began on August 1 to provide a pick-up and delivery service in the Detroit area and this activity will be expanded throughout the country. The Tigers are the 27th scheduled airline to become a member of the Air Transport Association of America.

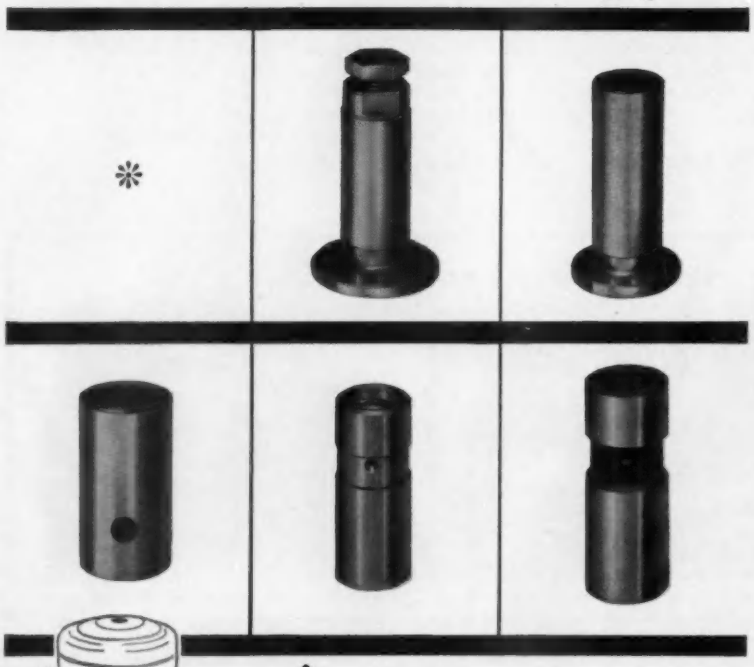
A Challenging Development

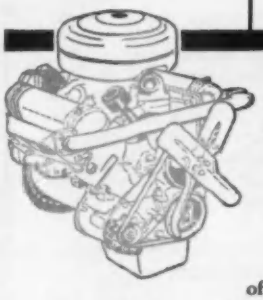
High speed intercontinental ballistic missiles must not become meteors. One of the most challenging problems facing engineers today is the development of a nose cone for missiles traveling at hypersonic speeds which will not disintegrate and break up like a meteor.

The nose cone is the extremely forward part of the missile and usually carries within it control guidance equipment and the warhead. Should any part of the nose cone disintegrate in flight, the missile would not reach its destination or perform its mission.

The General Electric Co., under contract with the Air Force, Air Research and Development Command, is employing well over several hundred research scientists and engineers to tackle this grave problem. Unknown technological areas must be explored and new equipment developed to study and test the kind of nose cone and structure which will hold up under the very high speed conditions of flight. A particular problem arises when the missile reenters the dense layer of air surrounding the earth after it has completed the greater portion of its flight.

JOHNSON *tappets*





keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"Tappets are our business"

JOHNSON PRODUCTS INC.

MUSKEGON, MICHIGAN

Miniature Gas Turbine

A new model gas turbine unit has been developed by AiResearch Manufacturing Division of the Garrett Corp. in Phoenix, Ariz. We refer to it as a miniature gas turbine because compared with the 20,000 lb thrust gas turbine units used in some of our modern aircraft, this small one develops only 100 hp.

It is a very compact unit, weighing approximately 175 lb and is designed as a power unit for driving ac or dc generators, liquid pumps and other applications. Although designed for airborne or ground support use, the unit can be adapted for mounting on jeeps, trailers, boats or aircraft as an auxiliary power unit.

The new gas turbine has successfully completed a 200 hr test run and one model has been operating on the Martin P5M flying boat for some period of time. The turbine has a two stage centrifugal compressor, a single stage radial-inward-flow turbine and an output shaft speed of 6000 rpm.

Aircraft Employment and Earnings

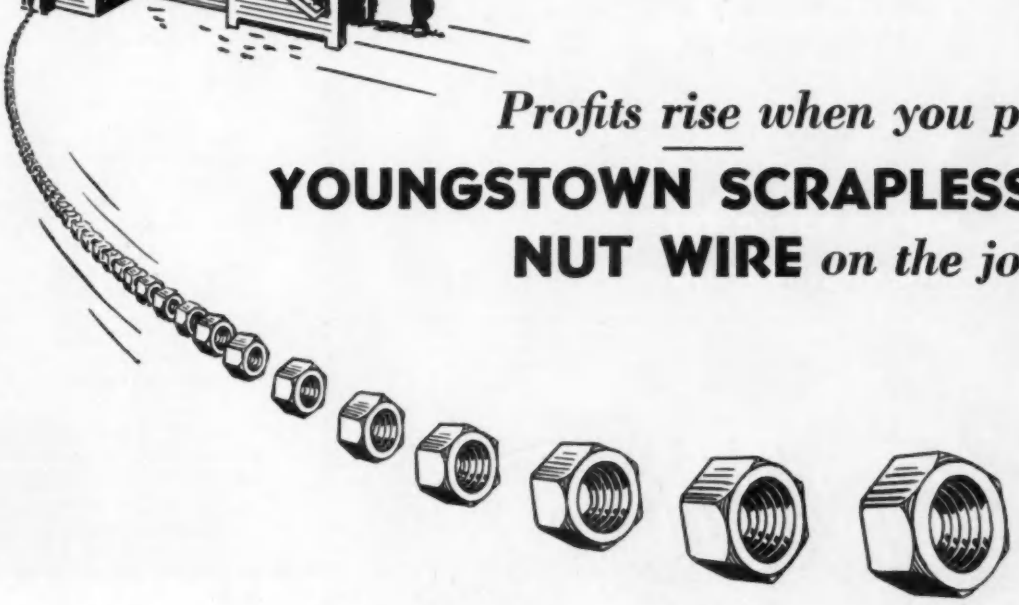
The Aircraft Industry employment totaled 789,800 in June, 1956, compared to 726,000 in June, 1955. Earnings of employes in aircraft and parts plants averaged $94.66 for one week in June, 1956, compared to $88.15 for a similar week in June, 1955.

Helicopter Sales

Manufacturers of helicopters who are member companies of the Aircraft Industries Association have reported total sales for the first six months of 1956. Military sales amounted to $119,732,000 and civilian sales $21,971,000, a total of $141,703,000. It is interesting to note that civilian sales in the second quarter of 1956 increased to $14,079,000 from a first quarter sales of $7,892,000.

Profits rise when you put

YOUNGSTOWN SCRAPLESS NUT WIRE *on the job!*



"Production up — rejects down which increased our over-all profit." We hear this story over and over from leading cold heading operators who specify and rely on Youngstown Scrapless Nut Quality Wire. It comes to your shop free from all piping, injurious seams, laps, die marks, internal tearing and cupping, and non-metallic inclusions —all of which defects skyrocket your reject rate.

Remember, because Youngstown controls all its processes, from ore mining to bundling of the finished wire, it's your guarantee for a continuous production of high quality, brightly polished nuts. Its smooth, strong coating prolongs die life thus minimizing costly die replacements.

Youngstown Scrapless Nut Quality Wire is immediately available in standard AISI as well as special resulphurized steels. Also, Cold Heading Bolt Wire, of the same high Youngstown quality, is supplied in all standard carbon analyses. Phone or write today to our nearest District Sales Office for any additional help or information.

Youngstown

QUALITY YOUNGSTOWN SERVICE

SCRAPLESS NUT QUALITY WIRE

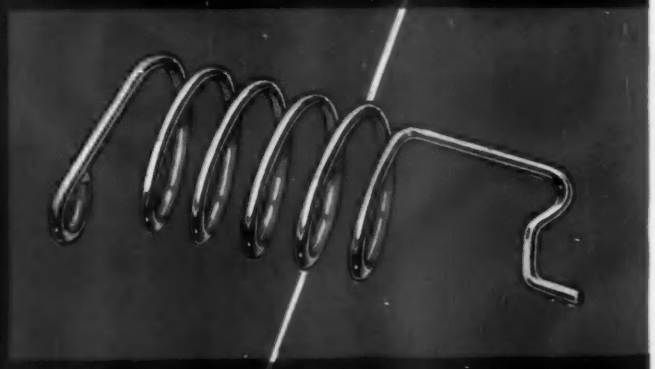
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

In the
old tradition of
Craftsmanship...

with modern design
and engineering...



Accurate CREATES a Spring

Accurate *CREATES* a Spring
—because Accurate approaches spring problems
with skill, experience . . . and imagination!

Accurate Spring combines old fashioned
craftsmanship, modern design and engineering,
and the most efficient production methods
to produce the finest of springs
at the lowest possible cost.

When YOU need springs, YOU need Accurate!

Accurate Springs

SPRINGS
WIRE FORMS
STAMPINGS

ACCURATE SPRING MANUFACTURING COMPANY
3810 W. Lake Street · Chicago 24, Illinois

AI TABLOID

(*Continued from page* 37)

U. S. Rubber Co. is building a new sales branch and warehouse at Omaha, Neb.

* * *

Kaiser Aluminum & Chemical Corp. has received ASME permission to use aluminum alloy 5086 for the fabrication of unfired pressure vessels.

* * *

Lunn Laminates, Inc., has opened another plant in Huntington Station, N. Y., and added new sales offices in New York City. . . . Molded Fibre Glass Body Co. has bought a plant at Ashtabula, O.

* * *

General Electric Co. is making plastic parts from polyethylene treated by electronic radiation.

* * *

International Packings Corp. has launched a two-year expansion program at its plant in Bristol, N. H.

* * *

Russian engineers are said to have constructed a trolley bus with accumulators that enable it to cut off from the transmission cable for up to two hours.

* * *

Induction Motors Corp. has acquired PSP Engineering & Manufacturing Co. . . . U. S. Industries, Inc., has acquired the assets of Western Design & Manufacturing Corp.

* * *

Russell, Burdsall & Ward Bolt and Nut Co. has initiated a new basic pricing structure for bolts, patterned after steel mill marketing practices.

* * *

Office of Naval Research is sponsoring a symposium on the "Technology of Molybdenum and Molybdenum Base Alloys" on Sept. 18 and 19 at the Rackham Memorial Bldg., Detroit.

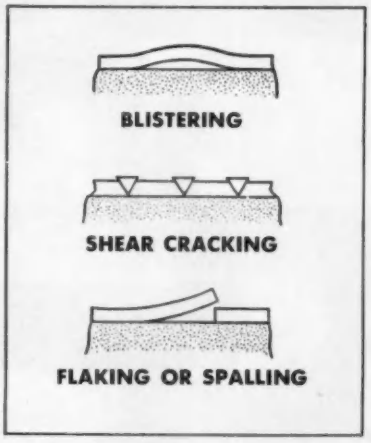
* * *

Negotiations between India and England for the manufacture of Gnat jet aircraft in India are expected to be completed very soon. . . . The next four years should see the complete manufacture in India of the British Meadows 4DC330 engine.

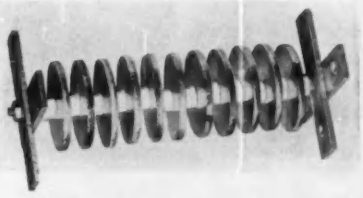
(*Turn to page* 134, *please*)

INCO RESEARCH OFFERS HELP

(Left) One phase of the search for answers to high temperature questions is the continuing work on new INCO Nickel Alloys. Here INCO metallurgists pour an experimental melt from their laboratory radio-frequency induction furnace. The resulting alloy may be a new solution to some of the unanswered high temperature problems facing engineers today.



Breakdown of oxides by blistering, cracking or spalling can cause rapid destruction. As the oxide layer breaks away, it keeps exposing fresh metal to further attack until its strength is wasted away. This type of failure can be avoided by using an alloy that resists the corrosive action at high temperature and protects itself with a tough adherent oxide.



Which of these metals will solve your problem? When INCO's High Temperature Engineers do not have a ready answer in all their amassed information, they make use of a test rack like this. After exposure to high temperature corrosion under actual service conditions, a direct comparison of the different samples indicates which metal or alloy may solve your particular problem.

What causes high temperature failure?

Strange reactions can take place when metals are exposed to high heat.

Even common soot and the air itself become destructive corrosives that can disintegrate a metal and waste away its strength.

High Temperature Corrosion

The more these reactions are studied, the more evident it becomes that the damage caused by high temperature corrosion is one of the most serious reasons for metal failures.

No single metal or alloy can resist all these corrosive conditions. For 20 years Inco metallurgists have been experimenting with controlled compositions of metals . . . searching for the answers to the problems posed by expanding temperature frontiers. From this work have come such strong, heat-resisting alloys as Inconel and Inconel "X," Incoloy and the Nimonic Alloys.

Have metals reached their limit?

Inco metallurgists think not. Who knows what future research programs may reveal?

Do you have a problem involving high temperatures? The solution may already be in the files of Inco's High Temperature Engineering Service. If not, our engineers will be glad to work with you to find it. Write for a "High Temperature Work Sheet" to help you outline your problem for study. After that it is up to us. There is no obligation on your part.

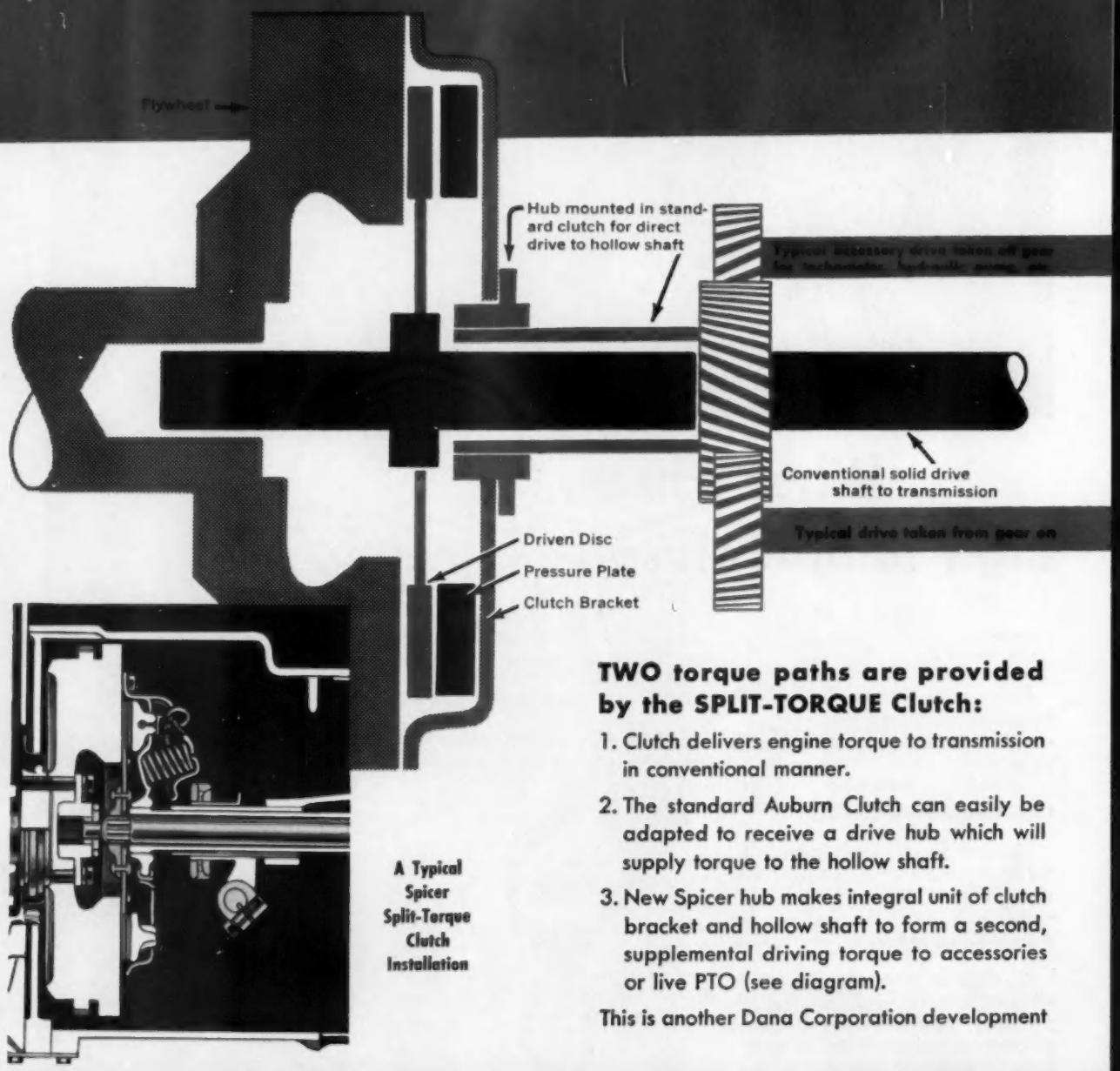
Nickel Alloys Perform Better Longer

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

The New Spicer SPLIT


Flywheel
Hub mounted in standard clutch for direct drive to hollow shaft
Conventional solid drive shaft to transmission
Driven Disc
Pressure Plate
Clutch Bracket

A Typical Spicer Split-Torque Clutch Installation

TWO torque paths are provided by the SPLIT-TORQUE Clutch:

1. Clutch delivers engine torque to transmission in conventional manner.
2. The standard Auburn Clutch can easily be adapted to receive a drive hub which will supply torque to the hollow shaft.
3. New Spicer hub makes integral unit of clutch bracket and hollow shaft to form a second, supplemental driving torque to accessories or live PTO (see diagram).

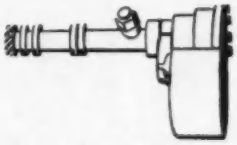
This is another Dana Corporation development

DANA CORPORATION • TOLEDO 1, OHIO

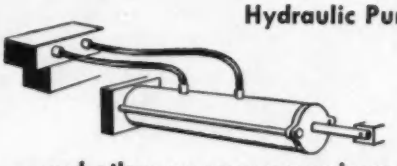
TORQUE CLUTCH

Provides TWO Torque Paths from ONE Power Source to do TWO DIFFERENT Power Jobs!

Tachometer

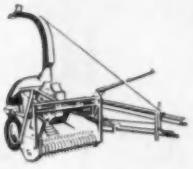


Hydraulic Pump

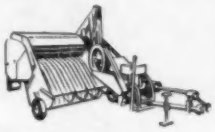


—and other accessory requirements

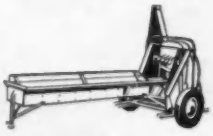
hollow shaft to live Power-take-off



Hay Pick-Ups

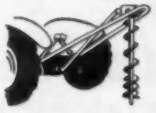


Balers



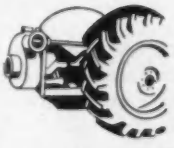
Forage Blowers

Elevators

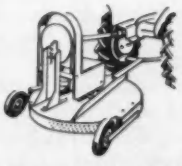


Post Hole Diggers

Sprayers



Irrigation Pumps



Rotary Mowers

—and other farm implements

to help make farm implement operation more simple, efficient, and profitable. Already several tractor manufacturers have adopted the new Spicer Split-Torque Clutch as standard equipment.

The Spicer Split-Torque Clutch, in P.T.O. operations, can eliminate gear shifting and two-thirds of the wearisome de-clutching and re-clutching work.

Simplicity of design, easy adaptability and strong sales features make this new Spicer Clutch desirable as an addition to your farm tractor specifications.

Spicer

SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER and AUBURN CLUTCHES • PARISH FRAMES • SPICER FRAMES

DANA CORPORATION • TOLEDO 1, OHIO

AI TABLOID

(*Continued from page* 130)

Outboard Marine & Manufacturing Co. has purchased Industrial Engineering, Ltd.

Harvey Aluminum has opened new engineering offices in Atlanta and Detroit. . . . Lockheed Aircraft Corp.'s Georgia Div. will establish aeronautical engineering offices at Dunedin, Fla.

* * *

Indian government is considering a proposal to install a heavy machinery plant in India with the help of Russia.

* * *

Electric Service Manufacturing Co. has been acquired by H. K. Porter Co., Inc.

Vanadium-Alloys Steel Co. has concluded an agreement with a French company for the formation of a new French concern. . . . Thew Shovel Co. has formed a Dutch subsidiary.

* * *

Wickes Brothers, a division of Wickes Corp., has changed its name to Wickes Machine Tool Div. of Wickes Corp.

* * *

Fabrica Colombiana De Automotores, S. A., is name of new company set up in Colombia, South America, by Austin Motor Co., Ltd.

* * *

H & H Machine Co., Inc., has been formed in Norristown, Pa., to specialize in the fabrication of tubular metal products.

* * *

Utility Truck, Inc., has opened a Detroit office at 18450 Livernois Ave.

* * *

Brooks & Perkins, Inc., has established a West Coast Engineering Div. at 11655 Vanowen St., North Hollywood, Calif. . . . Shallway Corp. has set up a Shell Mold Pattern Supplies Div.

* * *

Lockheed Aircraft Corp. has disclosed plans to expand airplane manufacturing facilities at its Bakersfield, Calif., subassembly plant.

* * *

Arwood Precision Casting Corp. has extended its production facilities to include finish machining of both ferrous and non-ferrous castings.

* * *

Rogers Corp. has purchased Cellular Rubber Plastics, Inc. . . . Air Cleaner Service Co. and Cyclone Sales, Inc., have merged under the new name of Cyclone Filter Corp.

* * *

Lear, Inc., will make and sell in the U. S. turbine engine control equipment developed by Ultra Electric, Ltd.

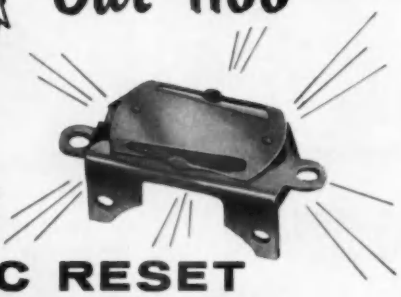
* * *

Harvey Aluminum Co. has completed arrangements for construction of a 54,000-ton aluminum reduction plant at The Dalles, Ore.

* * *

Thermo Materials, Inc., is name of new firm formed at Menlo Park, Calif. . . . Transportation Research, Inc., is name of new firm in Buffalo, N. Y., to provide safety devices for the trucking industry.

We're Proud of Our "1133"



FASCO

AUTOMATIC RESET MOTOR PROTECTOR

. . . NEW . . . but *proved* for positive protection against overloads and short circuits in low-voltage electrical equipment!

Yes, Fasco's new "1133" is now accepted as a standard safeguard for motors used in such applications as actuating seats, window-lifts and windshield wipers. Leaders in the automotive field regard its unique ability to protect low-voltage electrical equipment . . . and its dependability . . . as proof that it pays to

CONSULT FASCO *. . . FIRST!*

AUTOMOTIVE DIVISION

FASCO

INDUSTRIES, INC.

ROCHESTER 2, NEW YORK

DETROIT OFFICE—12737 PURITAN—PHONE: UN 17476

Light, rugged, fits any trailer— CLARK Tubular Trailer Axle

with brakes that set a new standard of high efficiency and low maintenance

This husky, lightweight axle has a one-piece tubular center of premium analysis steel, forged by the same process as the widely used Clark tubular Axle Housing. It is designed for practically universal application—in new trailers or for replacement; as a complete axle or as a tube minus wheel assemblies.

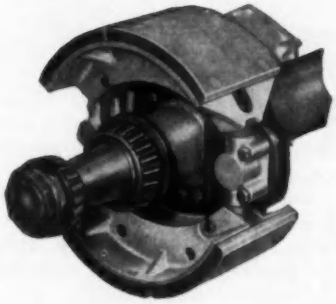
- Revolutionary brakes establish new standards for high operating efficiency and low maintenance. No slack adjusters or cam shafts. Brake actuators for air, hydraulic, vacuum or air over oil; all mountable at same location—minimizing inventory requirements.

- Two sizes:
  ND 18000—½ inch section, 5-inch OD
  ND 20000—⅝ inch section, 5-inch OD

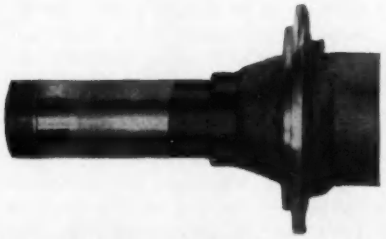
Standardized spindle dimensions make all wheel and brake parts interchangeable for both sizes, and also interchangeable with axles of other makes. Inventory needs are reduced to a minimum.

Brake linings and shoes can be removed for servicing without disturbing actuators.

As a practical, common-sense step toward more profitable trailer operation, send for the helpful Clark Trailer Axle Bulletin. Use the coupon.



Advanced Brake Design—both shoes are equipped with bell cranks and push rod; and provide Two-Leading Shoe effectiveness for highly efficient braking action in both Forward and Reverse. No stationary pivots—shoes have no fixed location, are free to slide; allowing full lining contact and compensation for wear.



Induction Hardening—For extra strength at a common area of failure, the inner wheel bearing surfaces are induction hardened, increasing the fatigue factor by 400 per cent.

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY
Buchanan 2, Michigan

Please send bulletin on Clark Trailer Axle.

NAME_____

COMPANY_____ POSITION_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Photo courtesy of Caterpillar Tractor Co., Peoria, Ill.

it's only part of the HTM* story...

STRENGTH

High ultimate strength of HTM castings helps the famous Cat D7 Tractor do the tough jobs day-in and day-out. Vital parts, such as the front idler adjusting nut shown, are made from HTM metal . . . the metal with the high ultimate strength that resists wear and fatigue under heavy loads.

And there are lots of other "plus" advantages in HTM castings. For example, they possess excellent non-seizing properties . . . can be either liquid or air-quenched . . . can be given a smooth finish. Perhaps *most important of all, HTM machinability index ranges from 80 to 90 (B1112 steel = 100).*

HTM castings can often reduce manufacturing costs, weight and assembly time . . . can increase quality and sales potential of *your* product. AA-3746-A

***HTM**—*High Tensile (Heat-Treated) Malleable*

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868 • Cleveland 6, Ohio

the nation's largest independent producer of malleable and pearlitic malleable

Industry News

(*Continued from page* 94)

Volkswagen Expands to Keep Leading Place in Car Market

Volkswagen continues to chalk up a remarkable success in the world automobile market. In spite of retaining a 20-year-old basic design, its sales have been limited only by production capacity.

In order to keep pace with demand, the company boosted production 36 per cent in 1955, while other German automobile manufacturers averaged a 33.5 per cent gain. Out of the 330,000 Volkswagen cars produced last year, 54.2 per cent were exported, as against 44.5 per cent the previous year. Nevertheless, the car accounted for 34.5 per cent of all 1955 new automobile registrations in Germany.

The production increases were the result of investments totaling $104.2 million since 1948. Due to these outlays, it is now possible for 23 workers to build one Volkswagen instead of the 55 needed in 1950, a gain of 140 per cent in productivity.

The benefits of the 1955 investment of $41 million are just beginning to be realized this year. Chief among these is the new factory in Hanover, which has released the main Wolfsburg plant from production of commercial vehicles.

The ultra-modern, $30 million Hanover plant is said to be one of the most automated automobile plants in the world. Its production, now at 220 units per day, will soon be increased to 300.

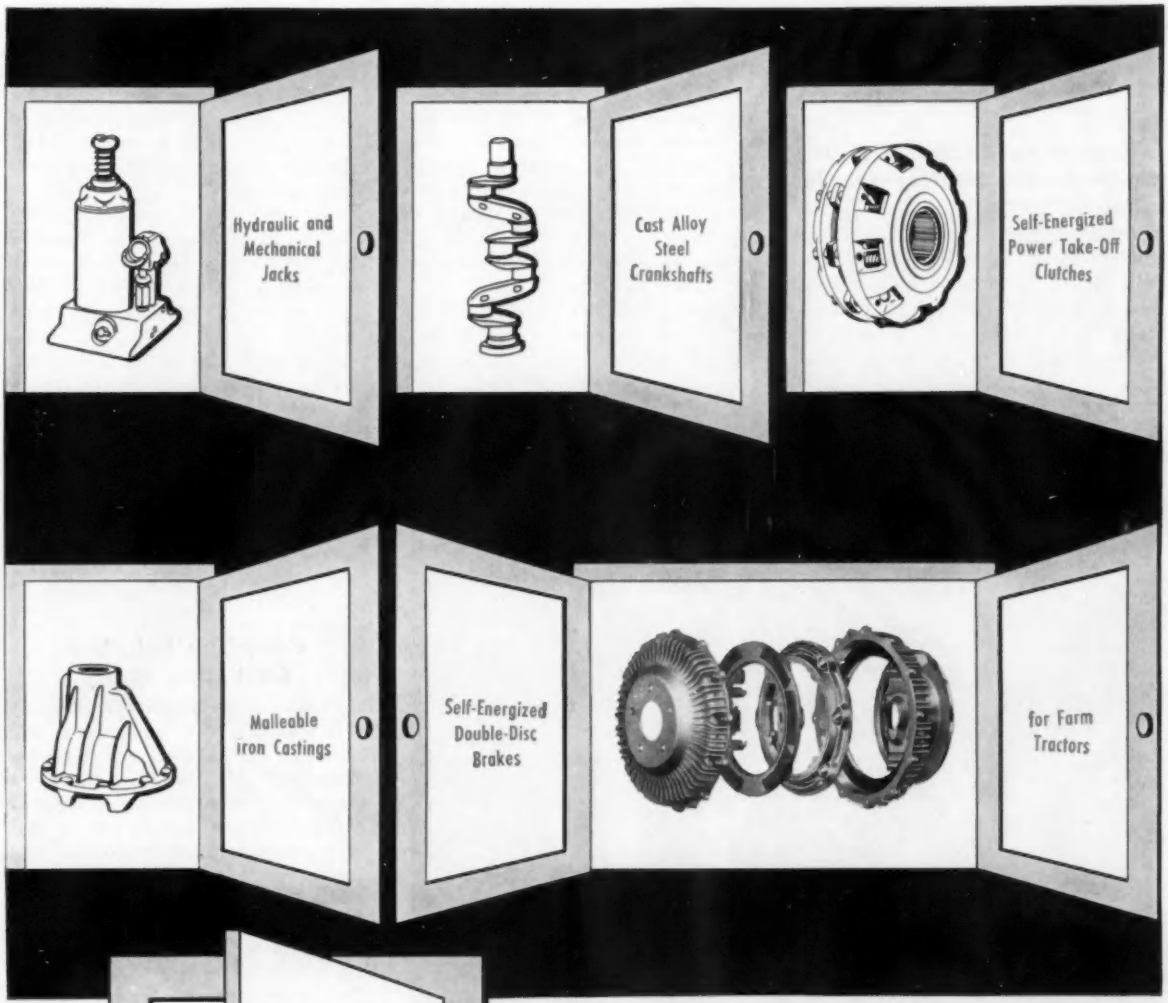
Meanwhile, the Wolfsburg plant has reached its current maximum output of 1520 cars per day. It will be further expanded and modernized in the near future.

China Purchases 63 Cars From British Producer

The Rootes Group has accepted the largest order from China so far received by a British car manufacturer. Sixty-three Humber Super Snipe luxury sedans are being shipped from England via Hong Kong for use in China by high-ranking Communist officials.

This follows the delivery by Standard of 28 Vanguard III sedans to Peking, where they will be used as taxis and by the government. The cars were driven in convoy from Hong Kong to the mainland.

(*Turn to page* 138, *please*)



For 48 years now we have been opening doors into new fields by working closely with our customers. Today, we are ready, willing and more able than ever to accept new challenges. We can be of help to you in solving your manufacturing problems. You will find our vast production facilities and engineering talent always at your service.

AUTO SPECIALTIES MFG. CO., INC.
SAINT JOSEPH, MICHIGAN
Plants also at Benton Harbor and Hartford, Michigan
and Windsor, Ontario, Canada
Manufacturing for the automotive & farm machinery industries since 1908

Industry News

(*Continued from page* 136)

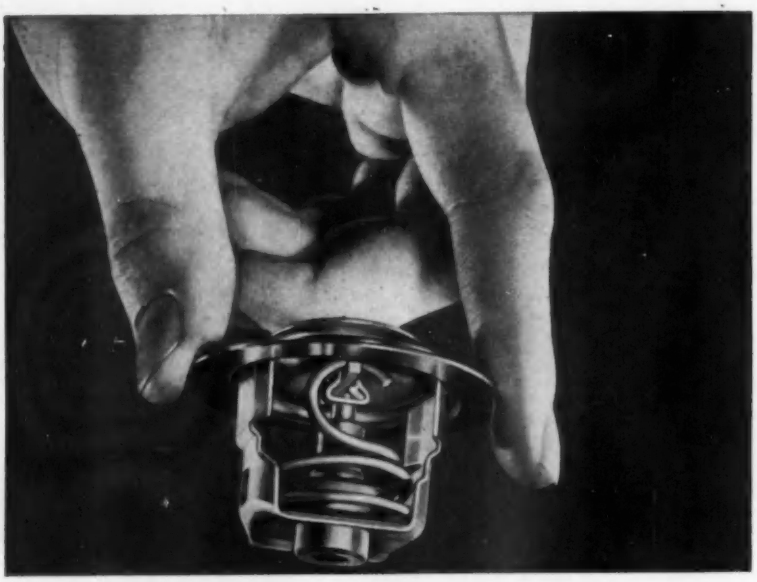
Automotive Aircraft Topics On Hydraulics Meeting Agenda

Included in the program for the forthcoming 12th annual National Conference on Industrial Hydraulics will be several subjects of interest to the automotive and aviation industries. The conference, to be held in Chicago on Oct. 18 and 19, is sponsored by Illinois Institute of Technology and the Armour Research Foundation.

The opening day's schedule includes a forum on pumps. E. H. Schanzlin of Pesco Products Div. of Borg-Warner Corp. will speak on "Higher Speeds and Pressures for the Hydraulic Pump," while R. B. Banks of Northwestern Univ. will discuss "A Comparison of Open and Closed-Center Type Hydraulic Systems."

Mobile equipment will be the topic of a forum the next day. R. M. Lehman of Ross Gear and Tool Co., Inc., will present a paper on "Power Steering for Off-the-Highway Vehicles." A simultaneous session on automatic machine tools will center around a talk by representatives of John S. Barnes Corp. on "Hydraulic Control of Automatic Mass Production Tools."

The aircraft systems phase will take in papers by R. K. Stoms of Bendix Aviation Corp. and D. B. Gardiner and F. L. Moncher of Vickers, Inc., on "Vapor-Liquid Ratio Meters for Aircraft" and "High Temperature Hydraulics in Airborne Equipment," respectively. Of special interest at the automotive session will be papers entitled "Development of a Hydraulic Starter for Cranking Diesel Engines" and "Torque Converters for Commercial Applications" by John H. Smith and R. M. Tuck, respectively, of Allison Div., General Motors Corp.



DOLE DV
THERMOSTATS
the accurate temperature control for modern engines

Highly developed for positive operation against the increased pump pressures in sealed cooling systems, and with all types of antifreeze solutions. Helps maintain best engine performance —speeds warm-up—saves gasoline and oil—reduces wear. Gets more heat from the car heater.

Now standard equipment on thirty-seven (37) leading makes of cars, trucks, tractors, commercial vehicles, industrial and marine engines.

Literature sent on request—please use your letterhead.

Control with Dole
DOLE
TRADE MARK
THE DOLE VALVE COMPANY
1901 Carroll Ave., Chicago 12, Ill.
Detroit • Los Angeles • Philadelphia

1906 Control with DOLE 1956 50th Anniversary

Committee Ends Quiz On Vehicle Safety

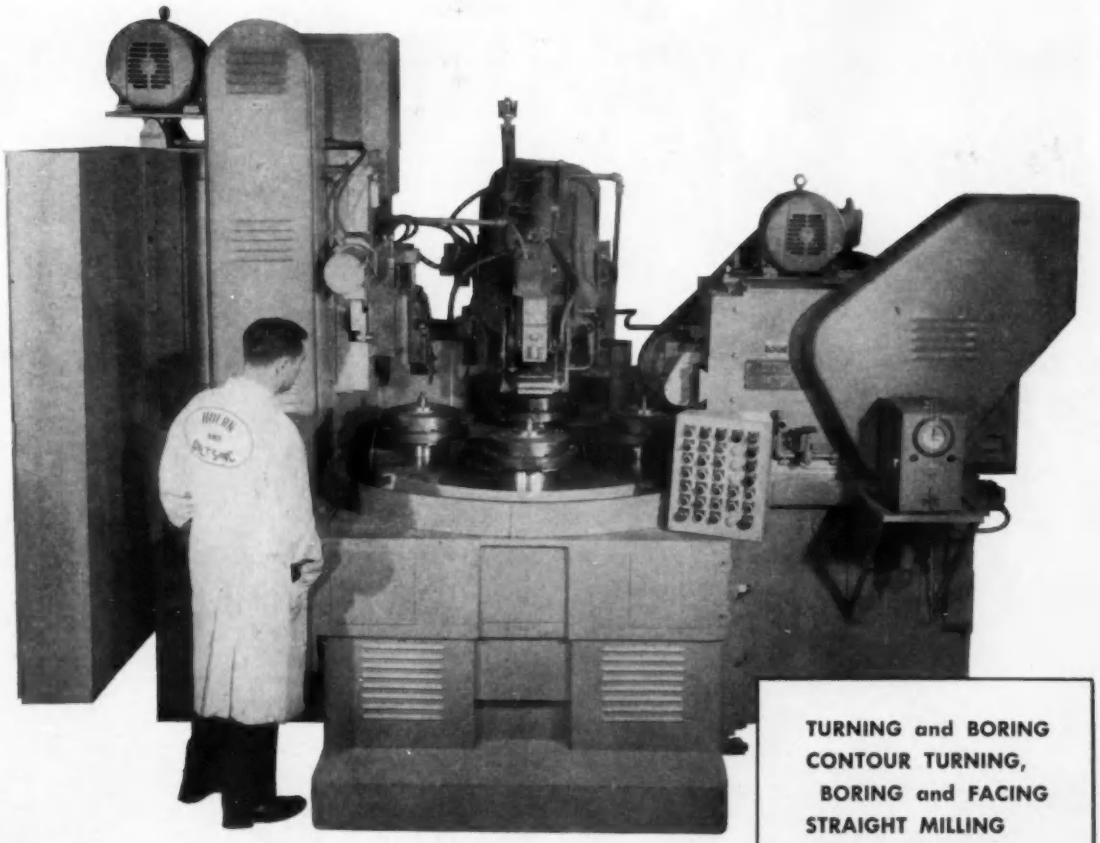
By and large, automobile manufacturers came off well in hearings held in August in Detroit and Kenosha, Wisc., by the House Commerce Subcommittee investigating highway safety. The investigation dealt largely with the manufacturer's role in making vehicles as safe as possible.

Chief interest of the committee centered in the high horsepower engine as it relates to top speed. Industry representatives emphatically stressed that high horsepowers are adopted principally for performance in the lower driving ranges for safety in passing, but the committee apparently felt that the industry had been guilty of overselling speed rather than safety in its advertising. The subject of a graduated tax based on horsepower came in for some discussion, but it is not thought that it will be given any serious consideration.

After demonstrations, presentations, and discussions at Ford, General Motors, Chrysler, and American Motors, committee members indicated they were highly impressed by the industry's comprehensive efforts to engineer safety into its vehicles.

An interesting departure from some recent Congressional investigations was that the committee itself was not on a witch-hunting, headline-seeking expedition. Members were objective, courteous, and extremely receptive to the industry's viewpoint. The committee undoubtedly came away from Detroit with a much bet-

(*Turn to page* 142, *please*)



TURNING and BORING
CONTOUR TURNING, BORING and FACING
STRAIGHT MILLING
CONTOUR MILLING
PLANETARY MILLING
I. D. GRINDING
O. D. GRINDING
SURFACE GRINDING
SURFACE HONING

You can combine these finishing operations on one Hoern & Dilts indexing finishing machine →

Indexing Table: Mounted on pre-loaded roller bearings. Index accurate to .0002". By providing adjacent spindles with proper chucking devices, *both ends* of a piece may be put through identical or closely related operations.

Heads: Individually cam-actuated heads, each designed for a specific type of operation which may be performed vertically or horizontally as required. Heads self-contained, with individual electrical, pneumatic and lubricating systems.

Speeds: One over-all speed may be used, or a different speed at each station. Spindles may be stopped and locked in any predetermined position at any station.

Feeds: Individually adjustable for each head.

Grinding Operations: Wheels dressed and compensated during index.

Automatic Gauging and feedback adjustment available at all stations.

A Hoern & Dilts Indexing Finishing Machine handles with *one* chucking and one operator, the operations ordinarily performed by several operators using completely different types of equipment.

This advanced approach to increased, more accurate production is accomplished by arranging a variety of self-contained heads around a central indexing table in which the spindles are mounted. Since all the operations are performed with a single chucking, all the proper relationships are maintained.

Hoern & Dilts engineers will welcome the opportunity to cooperate with you on any high production finishing operation.

HOERN & DILTS DIVISION

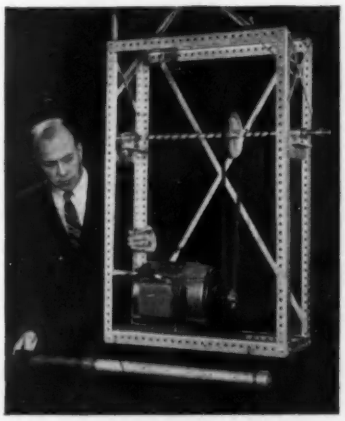
The New Britain Machine Company
Saginaw, Michigan

OTHER NEW BRITAIN MACHINE TOOL DIVISIONS:

New Britain-Gridley Machine Division
New Britain, Connecticut
Automatic Bar and Chucking Machines
Precision Boring Machines and
New Britain +GF+ Turning Lathes

Lucas Machine Division
Cleveland, Ohio
Precision Horizontal Boring, Drilling and Milling Machines

Motor and Control—
standard ratings now
available for immediate delivery
from warehouses coast-to-coast!



TOMORROW:

A standard motor that can survive infinite heat

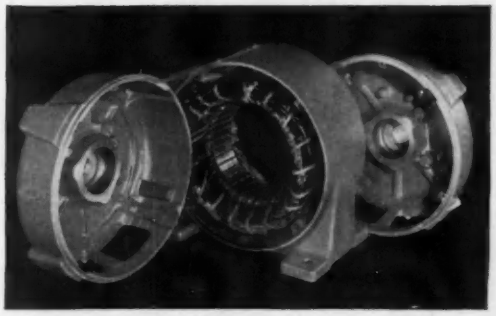
The new Life-Line A is another step closer

Westinghouse is working on tomorrow's motor today. Investigating new materials—testing existing motor designs.

No standard motor today can survive the ultimate test shown here. But we do know that the new Life-Line® "A" can operate under higher temperatures than ever before. It has stronger insulation and better bearing protection than any other motor on the market. It's industry's closest approach to a standard motor that is absolutely heatproof.

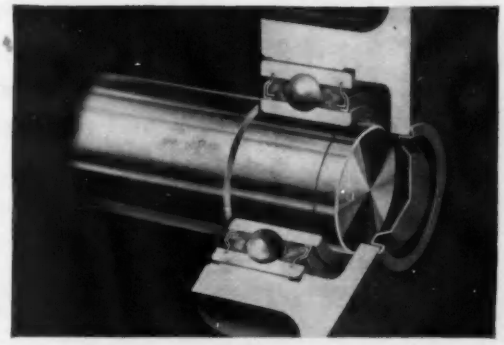
Your Westinghouse sales engineer can show you many additional reasons why the Life-Line "A" is industry's most advanced and preferred motor. Call him today.

21926-A



New fortified insulation includes exclusive Bondar, Bondite and Mylar*—three good reasons why the Life-Line "A" is so resistant to heat or any other motor contamination.

*DuPont Registered Trade-Mark



Two outer seals of new 4-way sealed bearing act as flingers and literally throw off damaging contaminations. Inner seals, attached to outer bearing race, are stationary and form a positive labyrinth.

WATCH WESTINGHOUSE!

WHERE BIG THINGS ARE HAPPENING TODAY!

A major development in small motor brushes

Stackpole Grade 373 fractional h.p. brushes show materially longer life coupled with minimum commutator wear. Ideally suited to cleaners, food mixers, sewing machines, calculators and similar motorized equipment, they are typical of progress achieved in Stackpole's continuing brush development program.

Brush headquarters for every type of rotating electrical equipment . . . backed by a half a century's specialized experience in developing and producing dependable carbon-graphite and metallic powder materials and components.

STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

Plants: St. Marys, Penna. (2) . . . . . Kane, Penna. (3) . . . . . Johnsonburg, Penna. . . . Canadian Stackpole, Toronto, Ont.

Industry News

(*Continued from page* 138)

ter understanding of the problems relating to safety and the tremendous amount of work that is being done to make automobiles as safe as possible.

Impact Of Vehicle Production On Raw Materials Makers Cited

The impact that automobile production continues to have on other businesses is illustrated in figures compiled by the Automobile Manufacturers Association. While undeniably car companies have been among the steel industry's biggest customers, producers of other metals and raw materials can attribute a large share of their growth to the automobile industry.

For example, the automobile industry last year used 40.7 per cent of the lead produced; 71.2 per cent of all aluminum permanent mold castings; and an impressive 71.5 per cent of all upholstery leather sold. It also bought 64.8 per cent of all natural rubber; at least 61.6 per cent of all synthetic rubber; 29 per cent of the zinc; 21 per cent of the nickel; and 10 per cent of the country's copper.

The steel industry last year sold 23.1 per cent of its total production to the automobile industry, compared with 18.7 per cent in 1954, which included all forms of steel. Car companies in 1955 consumed 38.7 per cent of the strip steel produced; 31.6 per cent of the bar steel; 49.3 per cent of sheet steel; 38.6 per cent of all alloy steel, excluding stainless; and 22.1 per cent of all stainless steel.

(*Turn to page* 152, *please*)

New Fork Truck

(*Continued from page* 104)

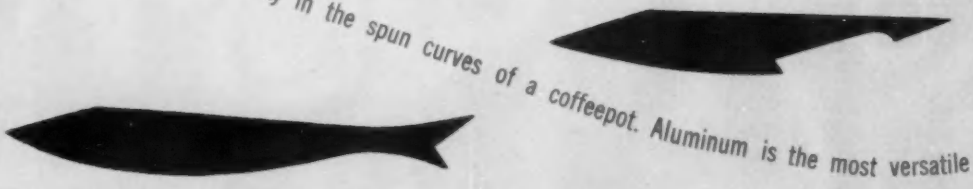
cated-for-life bearings are used throughout — there are no grease points.

The lighter model comes in capacities of 1500, 2000 and 3000 lb at 48 in. load length and 4000 lb at 40 in. load length. The heavier model is made in capacities of 4000, 5000 and 6000 lb at 48 in. and 7000 lb at 40 in. load lengths.

The aisle required for right-angle stacking with a 3000 lb, 48 in. long load is 122⅝ in. For a 6000 lb, 48 in. load, the aisle needed for right-angle stacking is 141⅝ in.

Aluminum is form

How many forms of this obliging metal do you see in a day? Strong forgings in a screaming jet fighter. Delicate foil yarns in milady's gown. Functional beauty in the spun curves of a coffeepot. Aluminum is the most versatile of all



design materials. Cast it, form it, roll it, forge it, extrude it, impact it. No fabricating process is foreign to this metal. Machine it . . . limited only by machine feeds and speeds. Join it by every common fusion process . . . plus unusual

ones like cold welding and roll bonding. Alcoa® Aluminum is available in more commercial forms, and can be made to your specification in more ways than any other metal. Infinity of form is another reason why aluminum is the designer's

metal and Alcoa your complete source of supply. LOOK FORWARD WITH ALCOA.

Alcoa is Aluminum

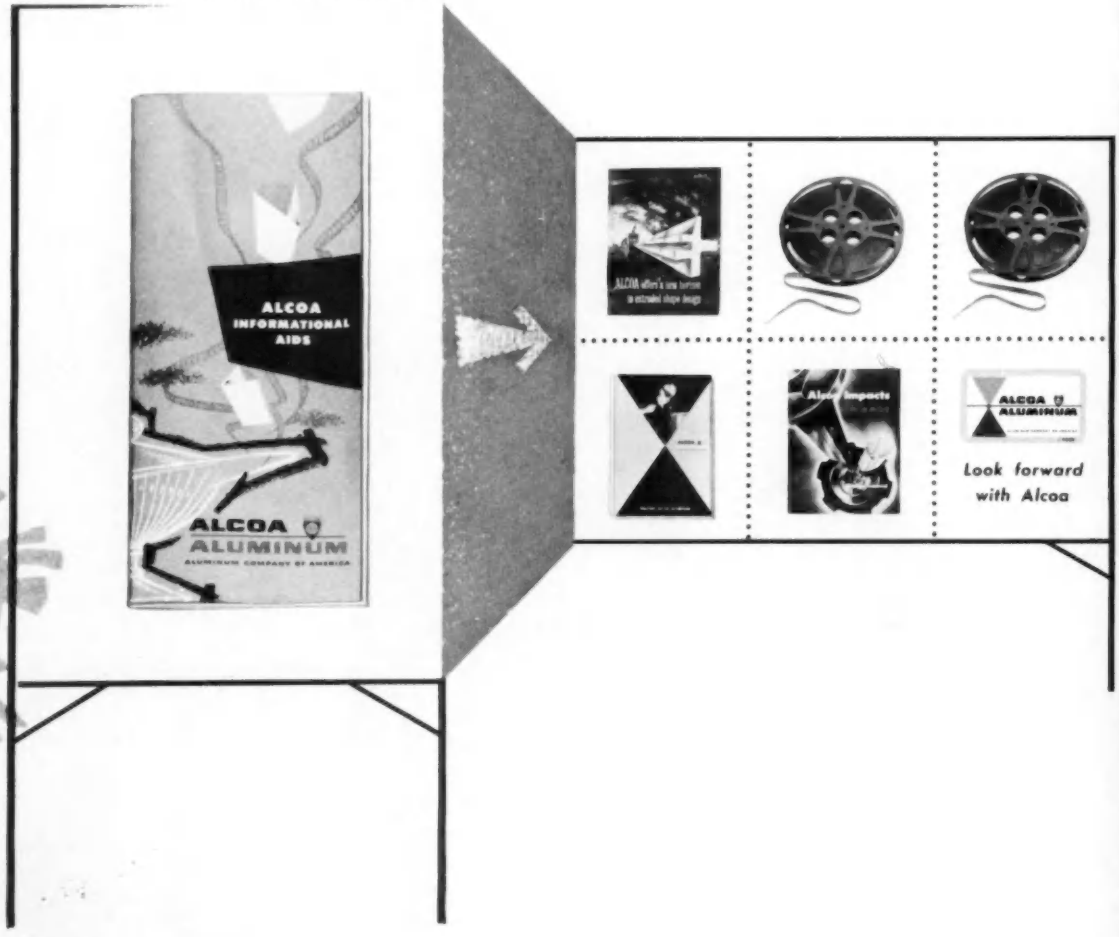
Learn more about designing in aluminum... this Alcoa Library index will help you

The fruits of 68 years of leadership in development, research and production at Alcoa have been capsuled for you in Alcoa's library of motion pictures and publications.

From the films and publications Alcoa makes available to you, you can check the ground rules for alloy selection. You can evaluate your designs in terms of fabrication methods: castings versus forgings; die castings versus sand, permanent mold or plaster castings; stampings versus machining, spinning or any other method . . . and aluminum can be fashioned by *every* method.

You can determine the best fastening or joining method . . . welding, brazing, soldering, riveting.

To make your selection of films and publications easier, just write Alcoa for your copy of *Alcoa Informational Aids* giving your company affiliation. ALUMINUM COMPANY OF AMERICA, 2181 Alcoa Building, Pittsburgh 19, Pennsylvania.



BOOKS . . .

DYNAMIC FACTORS IN INDUSTRIAL PRODUCTIVITY, *by Seymour Melman, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $4.75.* The author of this book has attempted to explore two parallel processes in business-managed industrial firms: the mechanization of production and the rise of administrative overhead. Taken together, as the author points out, these processes have a controlling effect on the productivity of industry's manhours. As a result of his investigations, he concludes that productivity changes are brought about by the joint efforts of employers and workers, each following its own group interests, but neither of them acting "toward explicit productivity goals."

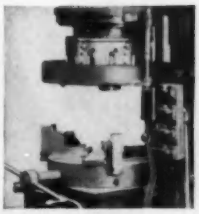
SYMPOSIUM ON ATMOSPHERIC CORROSION OF NON-FERROUS METALS, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $2.75.* This symposium covers a comprehensive test program for the measurement of atmospheric corrosion properties of non-ferrous metals. The tests were started 27 years ago by Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys. The materials utilized included 24 wrought alloys of zinc, nickel, copper, lead, tin, and aluminum. These metals were exposed at nine significant localities across the country and evaluated after periods of 1, 3, 6, 10, and 20 years. The test report lists all data gleaned from the test specimens, and nine papers discuss in detail the significance of the results in each metals field.

ENCYCLOPEDIA OF AMERICAN ASSOCIATIONS, *published by Gale Research Co., 424 Book Tower, Detroit, Mich. Price, $15.00.* This is the first edition of this encyclopedia, which lists non-profit associations that are national in scope. The directory has been divided into six sections under which are grouped the following types of organizations: Trade, business, agricultural and government; scientific and engineering; educational and social welfare; health and medical; general; and Chambers of Commerce. A Finding Guide, at the end of the book, provides a comprehensive index to every association listed. Each organization is listed by the regular title as well as by each key word appearing in the name.

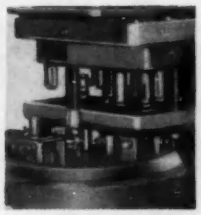
THE ANALYSIS OF STRUCTURES, *by Nicholas J. Hoff, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York. Price, $9.50.* Basing his book on the minimal principles and the principle of virtual displacements, the author attempts to present structural analysis as a logical and unified theory. Dr. Hoff has chosen as his starting point the principle of virtual displacements, which he calls "probably the most powerful tool of structural analysis." The unified treatment of structural problems and methods, although presented from an advanced standpoint, requires a minimum knowledge of structures, mechanics, or mathematics. As the author points out, the various methods used by structural engineers are all logically interconnected; and, once the principles are understood, every method is an almost obvious consequence, and can be derived without memorizing formulas.

AUTOMATION THAT'S EASILY RETOOLED FOR CHANGES

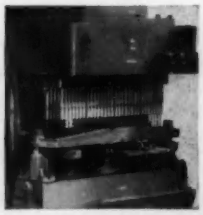
Baker Basic machines don't have to be "rebuilt" when you change your product or methods . . . cost much less than a machine specially designed for only one part . . . and pay for themselves even on lower production runs. Yet they still give you full automation with loading and unloading devices and conveyors . . . which we'll furnish as well as tooling. Use singly or in battery as a transfer machine . . . for drilling, boring, tapping, facing and other machining operations. 5 sizes.



Boring



Drilling and reaming with index fixture



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NAME AND TITLE

COMPANY

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CITY ZONE STATE

National Aircraft Show

(*Continued from page* 65)

Demon jet to outdo three others as he averaged 566 mph after being catapulted from the rolling decks of the aircraft carrier Shangri-la off the coast of San Francisco.

The Douglas trophy was won by Capt. J. T. Blackburn of Jacksonville, Fla., who climbed into an A-3d Skywarrior and raced from the carrier Shangri-la off the coast of Oregon to Oklahoma City at an average speed of 606.557 mph. Another cup, the North American trophy, was presented to Lieut. (JG) David K. Grosshuesch of Sheboygan, Wis., after he sped from the Shangri-la off the coast of Northern Mexico to Oklahoma City at an average speed of 537.849 mph.

The Allison trophy, strictly a ground-crew contest in quick engine changing, was won by the Webb AFB crew working under Staff Sgt. Eugene F. Bleckler. The engine-changers swapped the big J-33 in a record time of 8 minutes, 18.8 seconds, slicing three minutes off the old record of 11 minutes and 32.2 seconds for an engine switch.

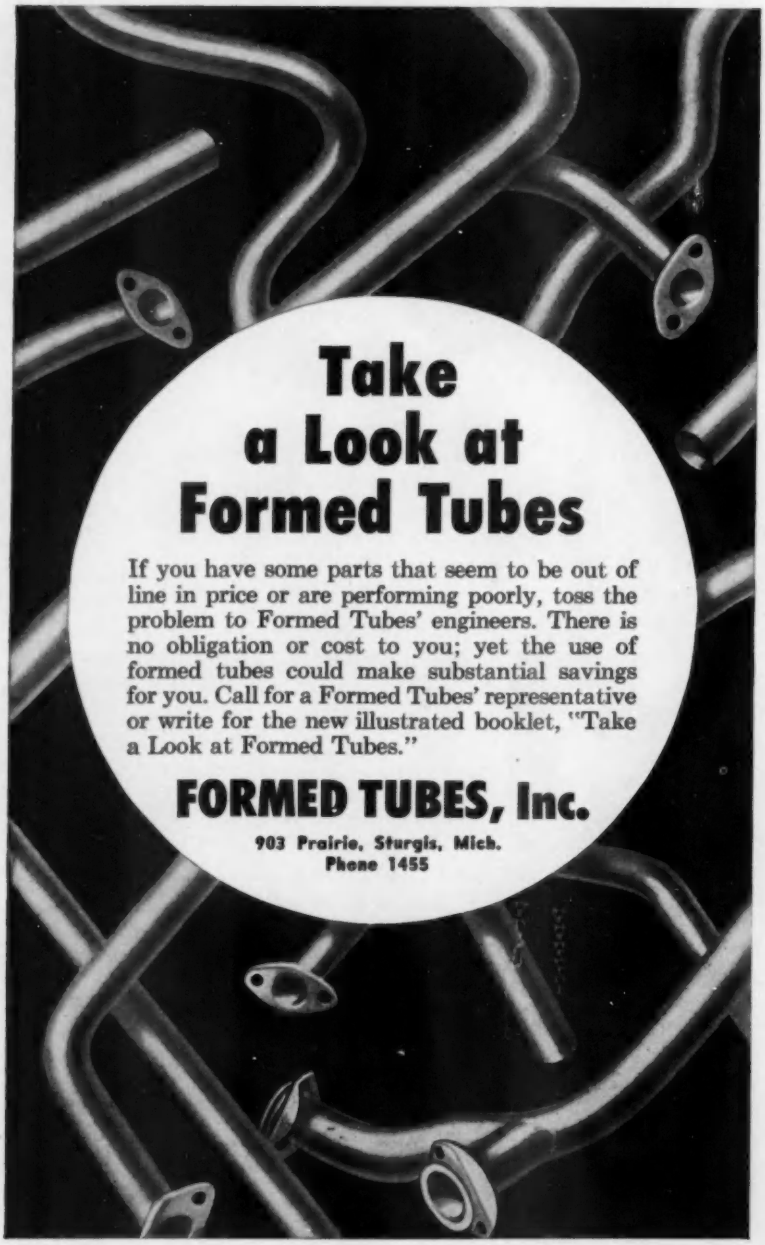
The F-104A Starfighter was put on public aerial display for the first time as the Air Force took the wraps off this fastest fighter ever ordered for tactical operation. The hush-hush plane is described only as "supersonic," however, air show officials boomed it as the fastest thing in the skies. It was not shown on the ground.

In static exhibits, the Navy and Marines teamed up to put out $1 million worth of its latest equipment in ground exhibits. The Air Force, in turn, placed a total of 23 aircraft on exhibit—among them the Northrop Snark, intercontinental guided missile which was seeing its second public showing.

Air Force ground exhibits included the Convair XC-99 cargo transport, Lockheed RC-121 Picket aircraft, Convair C-131 Samaritan, North American F-86D Sabrejet, Northrop F-89H Scorpion, North American F-100C Super Sabre, Martin B-57E Canberra, Cessna T-37 twin-jet trainer, Douglas X-3 experimental aircraft, Vertol H-21 Workhorse, Convair B-36, Douglas B-66 light bomber, Fairchild C-119 Flying Boxcar, Douglas C-124 Globemaster, Republic F-84F Thunderstreak, McDonnell F-101 Voodoo, Convair F-102 Delta, Boeing B-47 Stratojet, Martin TM-61 (tactical missile) Matador, Lockheed C-130 Hercules, Fairchild C-123 Provider, Northrop SM-62 Intercontinental Snark, Boeing KC-97 Stratotanker, and the Grumman SA-16 Albatross.

The Navy, boasting first showings of its advanced new T2V-1 SeaStar jet trainer (Lockheed) and primary jet trainer, the Temco TT-1, also claimed the biggest display in the show as it moored a mountainous Blimp at the exposition grounds. The Navy also displayed the Regulus guided missile, models of the Hiller flying platform and the Terrier missile as well as several static exhibits that included a J-34 Westinghouse cutaway engine. During the show, CAA approval of the veteran J34 axial-flow turbojet engines for commercial aircraft use was announced. The commercial designation of the 3400-lb turbojet is W-340. As a military engine the J34 has accumulated almost 2 million hours of flight time.

Other military exhibits included the Marine Corps' revolution "geo-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Formed Tubes
If you have some parts that seem to be out of line in price or are performing poorly, toss the problem to Formed Tubes' engineers. There is no obligation or cost to you; yet the use of formed tubes could make substantial savings for you. Call for a Formed Tubes' representative or write for the new illustrated booklet, "Take a Look at Formed Tubes."
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XVII

This is the seventeenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Uses of Aluminum in Alloy Steels

Aluminum as an element has been known to chemists and metallurgists for many years. It is never found in nature in its metallic state, being derived chiefly from bauxite, an aluminum hydroxide. Bauxite is present in various parts of the world, including several tropical and semi-tropical regions.

When used in the making of alloy steels, aluminum has several important functions. Because of its great affinity for oxygen, it is a reliable deoxidizer. It produces fine austenitic grain size. And when it is present in amounts of approximately 1 pct, it promotes nitriding. The nitriding process could be described as surface- or case-hardening by means of a nitrogenous medium, or by heating in an atmosphere of ammonia gas and dissociated ammonia mixed in proper proportions.

Other effective agents in producing nitrided cases are chromium, vanadium, tungsten, and molybdenum. As a rule, however, the hardest cases are obtained with aluminum-bearing steels, the nitriding grades being a good example. These are usually steels of medium carbon content with additions of chromium, molybdenum, and sometimes nickel.

Generally speaking, the lower the effective nitriding temperature, the harder the case will be. Aluminum-bearing steels usually show a case-hardness range of 950 to 1150 DPHN (diamond pyramid hardness number). Steels in which no aluminum is present have cases of substantially lower hardness.

If you would care to know more about aluminum as an addition or alloying agent in steels, Bethlehem metallurgists will gladly give you full information. Just write or call us; our technicians are always at your service. They will do everything possible to help make your problems easier. And whenever you need new supplies of alloy steels, remember that Bethlehem manufactures the full range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades.

If you would like reprints of this series of advertisements from No. I through XVI inclusive, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 16 topics are now available in a convenient 32-page booklet, "Quick Facts About Alloy Steels," and we shall be glad to send you a free copy.

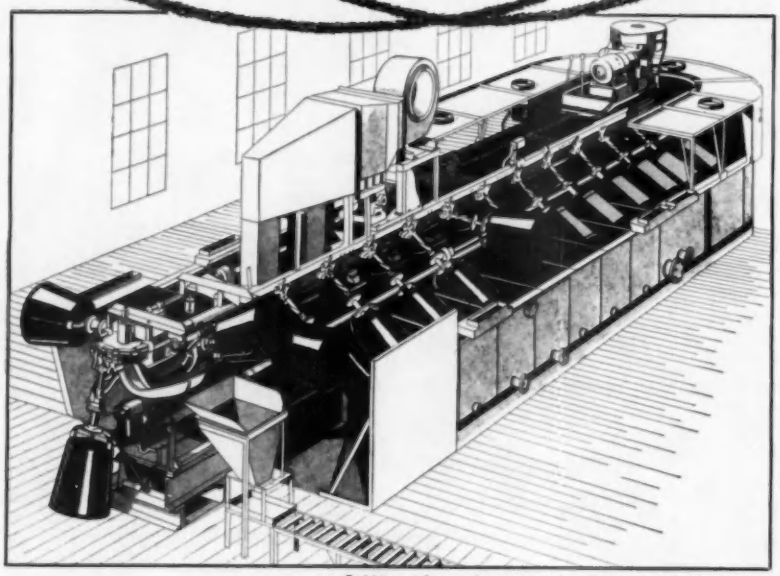
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Barrel Plating by Stevens Really Cuts Costs



End View of Stevens Super "E" Automatic Barrel Plating Machine.

Since Stevens first introduced the Automatic Barrel machine scores of industries have enjoyed these operational advantages. Check them against your present operations.

MINIMUM LABOR REQUIRED —In most cases, one unskilled employee can operate the machine.

HANDLES THE COMPLETE CYCLE —Including cleaning, pickling, chromate treatments, plating, bright dip and drying.

COMPLETELY AUTOMATIC —No barrel lids to fasten and unfasten during automatic loading and unloading.

BETTER HANDLING —No mixing of parts. Becomes a part of a straight line production system.

NO HEALTH HAZARD —Occupational health hazards eliminated with ventilation of equipment.

UNIFORMITY OF PLATE —Accurate plating cycles timed to meet your requirements.

FITS ANY PLANT LOCATION —Does not need special buildings—Can be moved at any time. Low head room.

DEPENDABLE —Scores of machines in use. Machine design and construction constantly improved.

LOW INITIAL COSTS —For average operation lowest initial machine costs.

LOW MAINTENANCE COSTS —Proven over years of use and in varied operations.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

Let a Stevens Sales Engineer show you how you can cut costs in your plating operation with a Stevens Automatic Barrel. Write us direct. Frederic B. Stevens, Inc., 1816-18th Street, Detroit 16, Michigan.

METAL FINISHING EQUIPMENT AND SUPPLIES, FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

BRANCHES:
Buffalo • Indianapolis • New Haven
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desic domes," designed as shelters to supplant tents and similar portable housing in combat areas; and the "Peeping Tom," the Army's 100-in. camera; as well as the Army's smallest experimental aircraft, the De-Lackner Aerocycle; the first public demonstration west of the Mississippi of the Army's new television drone plane system for observing military movements; and two of the Air Force's busiest aircraft engines, the jet J-47 and reciprocating R3350.

The J-47 engine, manufactured by General Electric, is a turbojet, axial flow engine, developing 5000 lb of thrust, and weighing 2500 lb. It powers the F-86 Sabrejet and the B-47 Strategic bomber. The R3350 conventional reciprocating piston engine is a cutaway version of the 18 cylinder Wright Cyclone, which develops 2500 hp and weighs 2800 lb. The engine powers the B-29 Superfort reconnaisance bomber.

Pratt & Whitney Aircraft's J-57 turbojet also played a major role at the exhibit, found in such fighter aircraft on display as the North American F-100, the McDonnell F-101 and Convair F-102 as well as the Navy's Douglas F4D and the Chance Vought F8u. There are eight J-57's in the Boeing B-52 intercontinental bombers. North American aircraft was also prominently on display.

Curtiss-Wright staged a mechanical exhibit, which included the turbo compound engine that powers the Douglas DC-7 and Lockheed Super Constellation and is rated from 3250-3700 hp; the J-65 jet engine with afterburner, with 7800 lb of thrust without afterburner; Turbolectric propellers presently used on several military transports; the Ram Jet engine, which reaches maximum efficiency at missile speeds of 1500-3000 mph; the electronic flight simulator and a 12,000-ton extrusion press.

North American Aviation, Inc., missile development division, ran a continuous motion picture on missiles, while across a mountainous hangar that housed part of the displays du Pont demonstrated rivets which are helping solve high-speed temperature problems.

Phillips Petroleum displays a booster rocket, while the Ford Motor Co. set up an extensive display around the J-57 turbojet engine.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

if the SERVICE MANAGER built the truck he services

ZENITH CARBURETORS

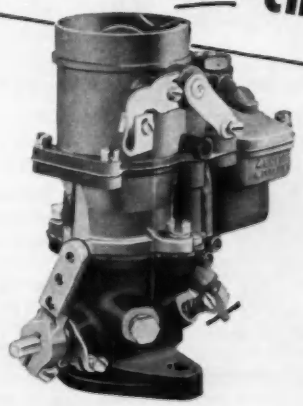
would still be *his* choice

Ask any service manager why he prefers Zenith* Carburetors and you will get a ready reply.

For shrewd parts and service managers know that with the Zenith Standardized Carburetor Service Program they can actually service more makes and models with a smaller inventory investment. Yes, operating costs go down, profits up, and customers are happier with Zenith Carburetor service.

There just isn't a question about it—if parts and service managers were in the business of selecting carburetors for standard equipment Zenith would be their choice.

This sounds like a pretty good reason why—if you build, buy, sell or operate trucks, Zenith should be your choice for the best in carburetion.



*REG. U. S. PAT. OFF.

ZENITH CARBURETOR DIVISION OF Bendix AVIATION CORPORATION

696 Hart Avenue • Detroit 14, Michigan • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

Huge Dynamometer for Axle Testing

(*Continued from page 63*)

tem. In effect, the power generated in the two absorption dynamometers is fed back through the line to provide power for operating the input machine. Consequently, the only function of the main motor generator set —once the cycle of operations has been established—is to make up for the amount of power lost in mechanical transmission, friction in the system, and the normal electric losses.

The console is provided with the following group of instruments and controls:

1. Chrono tachometer indicating meters for speed indication for each of the three machines.
2. Indicating ammeters for each of the three machines.
3. Indicating voltmeters for each of the three machines.
4. Speed control switch for the input machine.
5. Vernier speed rheostat for the input machine.
6. Start-stop station for the input machine.
7. Direction selector switch.
8. Current adjusting rheostat for the two output machines.
9. Field rheostat for the output machines.
10. Speed ratio adjusting rheostat for the output machines.
11. On-off stations complete with indicating lights.
12. Emergency stop station.

The control equipment also includes the mounting of three Foxboro torque indicating meters; master control for a magnetic clutch; and thermocouple indicators.

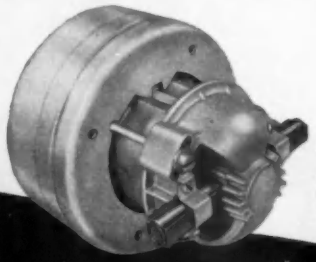
In addition to the main operating functions of this equipment, provision has been made for a differential in speed of some 10 per cent between the two absorption machines, thus providing for a measure of differential action between the two axles.

This dynamometer will make it possible for the first time to test rear axles at the proper speed for maximum torque loading without intermediate gearing. Moreover, it becomes a part of the statistical control aspect of the manufacturing division, permitting the endurance testing of production axles taken directly off production lines. Besides checking on the durability and load-carrying ability of the variety of steels available to the company, it is expected to promote investigation of production tooling, modern gear making techniques, etc. The effects of design tolerances, deflections, gear tooth form, and the many other variables involved in the problem can be better measured and evaluated by this new method.

In fact, it is anticipated that the ultimate results will make for still better and closer relationship between basic engineering and manufacturing.

The large test area shown on the floor plan also includes an installation of a conventional Gleason four-square testing machine. The entire interior has been treated with sound-absorbing panels, thus making it easier to observe the noise level of the work under test.

standard in its field the world over...



Turbine for canister-type vacuum cleaner.

Equal Quality Assured for YOUR Motor-Driven Products

Ruggedly constructed equipment motor.

Intermittent high torque aircraft motor.

The outstanding quality and performance of the Lamb Electric vacuum cleaner motor, shown above, result from proper design and careful manufacture, by personnel having years of experience in the small motor field.

High quality and controlled costs go hand-in-hand because our company is equipped and organized to *custom manufacture* on a volume basis.

Ask us to demonstrate the benefits of Lamb Electric special application motors for *your* products.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

Four Wheel Drive Sales Way Ahead of 1955 Mark

Development of a broader market for its products has been chiefly responsible for boosting earnings of Four Wheel Drive Auto, Clintonville, Wis., to the highest level in nearly 10 years. The company's net for the fiscal year ended June 20 totaled $577,176 compared with $184,927 in the previous fiscal year.

Sales volume increased by 42 per cent to $18.2 million from $12.8 million.

For more customer satisfaction—equip your trucks with the world's most preferred air brakes—BENDIX-WESTINGHOUSE!

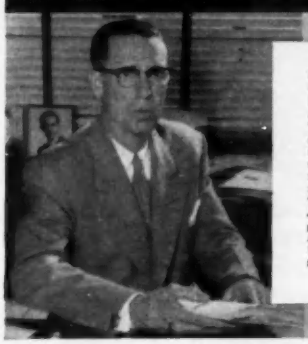
"In our 25 years in business

We've bought 1,455 trucks

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

Bendix-Westinghouse!"

THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES



MR. P. M. THOMAS, President
All States Freight, Inc.

From his company's modern main terminal and executive offices in Akron, Ohio, Mr. Thomas directs the activities of a firm serving the area from Chicago, Illinois, in the west to Boston, Massachusetts, in the northeast, and Baltimore, Maryland, in the south. This safety-conscious organization, winner of two consecutive President's Trophies each signifying 1,000,000 miles of accident-free driving, employs over 850 people and maintains 14 terminals. In 1955, All States Freight, Inc., rolled up nearly 17,000,000 miles while operating on certified routes totaling 4,157 miles.

"We've bought 2,000 trucks

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

Bendix-Westinghouse!"

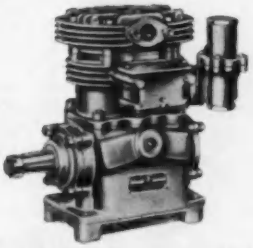
THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES

MR. STANLEY L. WASIE, President
Merchants Motor Freight, Inc.

"Don't mark it rush, mark it Merchants—synonym for speed, dependability, and complete transportation satisfaction" is a slogan that Mr. Wasie and all 750 employees of this big St. Paul, Minnesota, trucking firm strive to make a living symbol to all shippers. Last year Merchants' rigs rolled up a total of nearly 14,000,000 miles while travelling routes of 5,497 miles. Merchants Motor Freight, Inc., maintains thirteen terminals located in the states of Minnesota, Illinois, Iowa, Missouri, Nebraska, Colorado, Michigan, and Ohio.

For twenty-five years Bendix-Westinghouse Air Brakes have been the first choice of truck manufacturers and truck operators everywhere, consistently outselling all other makes of air brakes combined. In fact, recognition of the greater safety, economy and dependability of Bendix-Westinghouse Air Brakes by truck buyers has resulted in their factory installation on an ever-increasing number of truck models of all sizes.

Chances are good that your trucks, too, offer the many advantages of these powerful brakes. If not, we suggest that you take advantage of the proven preference and superiority of Bendix-Westinghouse Air Brakes by offering them as factory-installed equipment. It's one sure and easy way to add more sales-appeal to your vehicles!



Over 1,500,000 compressors, produced over a twenty-five-year span, stand behind the TU-FLO 400. Many advanced features guarantee performance no other compressor can equal.

Bendix-Westinghouse BENDIX-WESTINGHOUSE AIR BRAKES ® **AIR BRAKES**

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • General Offices and Factory—Elyria, Ohio • Branches—Berkeley, Calif. and Oklahoma City, Okla.

...FOR *Modern* FASTENING METHODS

Today's engineers and designers using the modern "***Tubular*** Way" of fastening do so for four good reasons. One is that ***Tubular*** rivets solve such problems as close centers and hard-to-reach locations. Another is that the full shear strength and strong clinch of ***Tubular*** rivets permit their use in countless jobs. A third advantage lies in lower assembly costs, because of the economy of ***Tubular*** rivets themselves and the speed with which they can be set. And fourth, fastening the "***Tubular*** Way" means high production when you use automatic riveting machines designed by ***Tubular.***

You can see how these advantages will work for you by sending ***Tubular*** a print, sketch or sample of your present or planned assembly. Talk to ***Tubular*** — for *modern* fastening methods.

Tubular Rivet & Stud Company

WOLLASTON (QUINCY) 70, MASS.

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See your local classified directory for phone numbers.

Industry News

(*Continued from page* 142)

GM Engineers Discover Source Of Unburned Fuel In Engines

Discovery by General Motors engineers of the source of unburned fuel that remains after combustion takes place in an automobile engine marks a step forward in the industry's research on the smog problem.

Although GM engineers have known for a long time that a portion of the fuel passes unburned through an engine, they only recently found that a thin coating of the fuel (about .002 to .005 thousandths of an inch thick) remains around the walls of the combustion chamber. Photos showed that the mixture does not burn next to the walls because they remain relatively cool after combustion.

The findings are significant in that they seemingly indicate hydrocarbons in exhaust gas of automobiles are at least partially responsible for the smog. However, they likewise appear to disprove earlier studies which indicated that a very high percentage of the unburned fuel which passes through an engine occurs on deceleration.

The latest study showed that only about one-third of the total amount of unburned hydrocarbons is emitted through the exhaust during deceleration. The remaining two thirds of unburned gas emission occur during acceleration and cruising, according to the GM study.

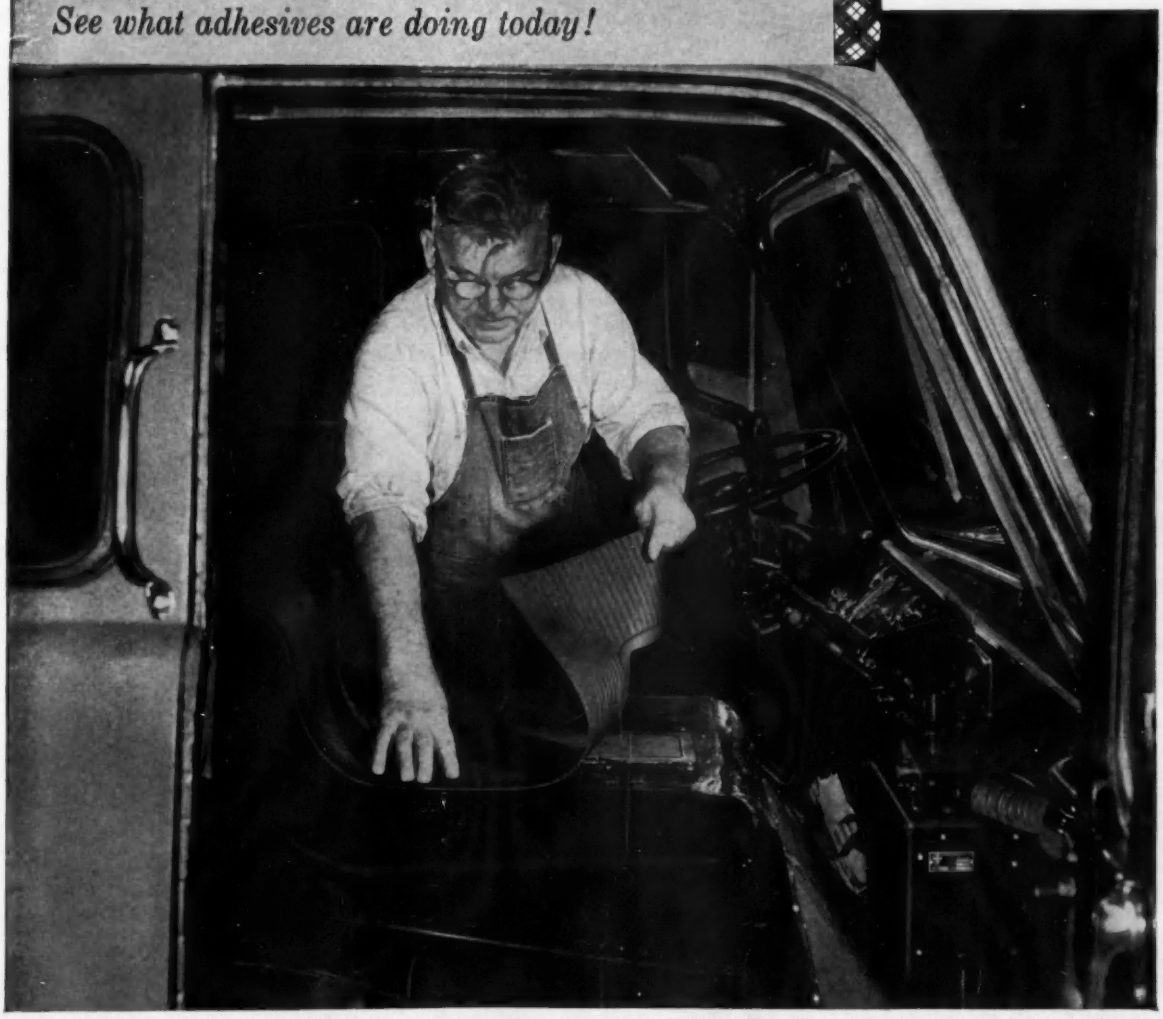
Factories Say Car Dealers Abusing New Warranty Plan

Automobile companies are said to be concerned about dealer abuses of the 100 per cent warranty labor recovery policy instituted this year. One reportedly made a spot check in several cities by requiring all parts replaced to be turned back. It allegedly found that of 17 of a certain part returned as faulty, 15 were perfect, while the remaining two were doubtful.

Other findings reported were: poor diagnosis, parts returned that were not of company origin, and packing of labor charges. Cost of full reimbursement is proving so high that it may affect new car prices. If abuses get out of hand, factories may well institute much more severe forms of control on paying warranty claims.

(*Turn to page* 170, *please*)

See what adhesives are doing today!



A 3M ADHESIVE FASTENS DOWN THIS RUBBER MAT FOR KEEPS. IT'S CLEAN, QUICK AND EASY, MAKES NO MESS IN THE CAB INTERIOR.

Dressing up the "doghouse"

How would you fasten the trim on this truck engine cover? The fastener must fight heat, stress and vibration. And it has to be able to hold this rubber mat tight year after year, for hundreds of thousands of punishing miles.

Yet a 3M adhesive does the job. This worker quickly brushes EC-882 on the painted "doghouse", presses the rubber mat in place. High-strength, fast-drying EC-882 grips immediately and for keeps. In addition, EC-882 bonds rubber weather strip to the cab's enameled doors and door frames.

Another 3M adhesive, EC-871, fastens fibrous glass insulation to the cab roof and vinyl-coated jute to back and side panels. After 15 years of using 3M adhesives, this manufacturer can't recall one case of adhesive failure.

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Heavy Duty Suspension System

(*Continued from page 49*)

suspension system. In the Clark arrangement, the usual sway bar is eliminated. Instead, there is a large torsion bar splined within each of the radius arms at the outboard bearings, extending laterally to the opposite side. Torsion bars have limited end play within the radius arm to permit free movement. The rubber bushings or rings supporting the ends of the radius arms within the outboard bearings permit of considerable flexibility, making it possible for a certain amount of movement of the radius arms to accommodate deflections in the system.

The concept of automatic leveling also is distinctive. It will be noted that the suspension is a self-contained unit with its own side rails and cross-members. The side rails also serve the dual function of being air reservoirs. Air is delivered from the air compressor system of the vehicle to the air reservoirs through a single air line to a Tee fitting. From this point the air supply is distributed to two air control valves, designed by Clark for this purpose. Each one serves one of the air reservoirs and each one functions independently of the other.

In addition to the simple valving arrangement mentioned above, there is a safety air valve in the line leading from the compressor, designed to shut off at 60 psi, or below, to protect the service brake system.

In operation, therefore, when a vehicle is being loaded the line from the compressor is open and both receivers fill sufficiently to support the full load at constant and level platform height. This is about the only time in the cycle that the air compressor is required to service the suspension system. The compressor is not required to operate continuously at any other time.

Automatic leveling then is effected by the control valves for each side. Air is automatically fed or bled from one side or the other to maintain a level platform, and air is automatically bled from the entire system as part or all of the load is removed.

Observations of vehicles operating on curves and rough terrain have shown that the road wheels are held constantly on the road surface. At the same time the ride in the cab and in the trailer body is maintained smoothly and without shock.

One of the most exacting tests that had to be met by the suspension system during the development period was in the operation of large tank trailers. Tests were made with tanks fully loaded. Other tests were run with tanks part empty to note the effect of fluid sloshing. These tests were all completed acceptably.

Readers of AI doubtless will appreciate the need for ride improvement without prompting. It is well to point out, however, that apart from improved ride characteristics, a new order of suspension is indicated for the protection of fragile cargo of all kinds. Moreover, it is claimed that most of the damage to heavy duty vehicles such as flat bed steel trailers, automobile haulaway trailers, and the like occurs when they are returning empty and traveling at high speeds. On such occasions the stiff suspensions, required for maximum loading, are not suitable for empty driving.

To review the matter briefly, Clark offers three basic units of suspension: an independently sprung front axle which provides for an improved roll center for any vehicle, in addition to

Hardened and Ground Parts are our *Specialty*

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2⅞" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 —.001.

Parts like this are our specialty —we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

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The new 4-wheel drive Oshkosh 50-50 ready-mixed concrete carrier is built to haul up to 5 cubic yards legally, with enough water for ready-mixed concrete operations. Its Continental Red Seal B6427 engine is cantilevered forward of the front wheels, distributing the load equally between the two axles, and making the unit conform to maximum load limits in most states . . . Continental F4162 engine driving the 4½ cu. yd. Rex Adjusta-Wate Moto-Mixer is mounted at rear of the machine, making possible the most efficient load distribution over all axles, for carrying maximum payload.

When it comes to tough jobs, the hauling of ready-mixed concrete ranks well toward the top of the list. It takes a real engine merely to move such a monster as this, to say nothing of lugging it over all sorts of terrain in order to spot the load. Continentals have been known for dependability for more than half a century. Their famous in-built stamina is earning them a place in more and more of today's heavy-duty equipment, not only in transportation but in industry and farming as well. Every Continental Red Seal is built for the job in which you find it—and backed by service and parts facilities coast to coast.

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offering a vastly improved ride; single or tandem axle suspensions for driving axles; single or tandem fixed suspensions for trailer axles; and tandem sliding axle suspension for trailers. At the option of the manufacturer or the fleet operator, it is feasible to use any one of the units alone or two or three in combination.

It may be of interest to technical readers to list some statistical evidence developed by Clark. First of all, the use of Clark suspensions affords the following range of spring frequencies:

Arrangement	Empty	Loaded
Front Suspension	106	95
Driving Axle	95	89
Tandem Trailer Axle	95	89

This compares with a passenger car ride of around 80 cpm in keeping with findings of the SAE Riding Comfort Committee.

We mentioned earlier the conclusion that automatic leveling is unnecessary at the front end. It was noted that variations between loaded and empty conditions were not sufficient to warrant leveling at the front, although it was imperative at the driving axles and on the trailers. Here are some significant figures to illustrate the situation:

Arrangement	Empty	Loaded
Front Axle	4500 lb	6000 lb
Driving Axle	7000 lb	18,000 lb
Tandem Trailer Axle	10,000 lb	36,000 lb

Finally, it may be observed that many of the leading truck manufacturers have completed preliminary testing and have on order sample suspension systems for selected ranges of their vehicles for testing for acceptance.

Canadian Vehicle Output Shows Only Slight Decline from 1955

Canadian automotive manufacturers during the first half of 1956 produced a total of 276,496 cars and trucks for sale in Canada and for export. This figure compared with 280,365 units in the first half of 1955 and 246,129 in the first half of 1954.

Of the total 1956 production in the first half year, 206,782 passenger cars were made for sale in Canada and 14,833 for export. In 1955, the figures were 216,050 and 16,293, respectively.

Truck and commercial vehicle production totaled 50,466 units for sale in Canada and 4415 for export in the first half of 1956. This compared with 41,456 and 6672, respectively, in the first half of 1955.

(Advertisement)

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Selecting the right grade of bolt

With few exceptions, the true function of a bolt is to clamp members together, and not to act as an axle or fulcrum. The residual tension set up in the bolt keeps joints tight.

There's rarely need for costly alloy steel fasteners—not when 3 physical grades of steel can satisfy most "clamping" applications.

SAE grade 1 offers 55,000 psi minimum tensile strength; grade 2, 68,000 psi; and grade 5, approx. 120,000 psi.

The first is used for fasteners which are stress-relief annealed to increase ductility. The next provides low carbon fasteners with a bright finish. The last goes into high-carbon, heat treated black fasteners identifiable by three radial dashes on the head.

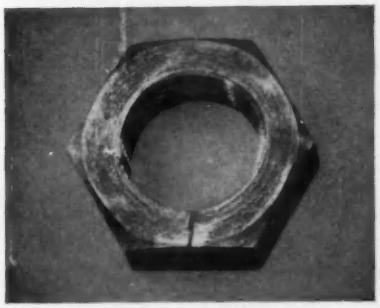
SOME SUGGESTIONS

In terms of holding power, the stronger bolts and cap screws can cost you less than the cheaper bright ones. For example, either a ⅝" with three radial dashes or a ¾" bright cap screw can be used for a safe working load of 20,000 pounds. But being smaller, the high strength one costs less. However, if the same diameter is desirable, then fewer bolt holes need be made and faster assembly achieved when a product is designed to make use of high strength bolts.

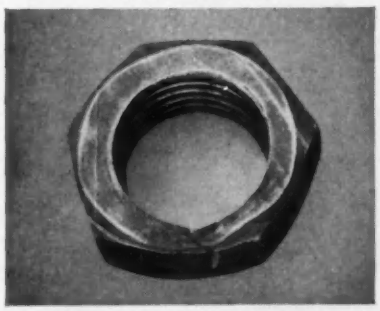
In short, for more pounds of clamping effort per dollar, use high strength fasteners; for more pieces per dollar, use the lesser grades.

Cold Punched Nuts add to safety factor

NUTS dilate when tightened on a bolt. They also adjust plastically to distribute the load over many threads. Since nuts are overdesigned to be stronger than the bolt, these stresses can be disregarded for all practical purposes.



How a defect in hex bar caused split in nut machined from it.



Drift punch had to distort cold punched nut severely, far beyond its yield point before it cracked.

There are times, however, when nuts with optimum assurance against service failure are desired. In such cases, it pays to consider use of RB&W cold punched nuts.

These nuts are punched at right angles to the metal's flow lines . . . same direction as stress encountered in service. No unrelieved stresses are set up. The initial punching automatically reveals any defects. Repunching, an RB&W development, then not only trues up the hole for clean, concentric threads, but also serves as a drift punch test, automatically checking the soundness of these safest of nuts.

For help in applying standard fasteners to assure more assembly strength and less assembly time, feel free to call in an RB&W man. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore, (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

One-piece fastener better than two

One particular oil filter used to be fastened with stud and cap sleeve made by screw machine. This was only until RB&W pointed out that a one-piece fastener could be formed easily on a cold header. The advantages gained are obvious. The single fastener *cost* less, and took *less time* to assemble.

RB&W makes a tremendous variety of strong, uniform standard fasteners to improve assembled metal products. If any of these don't fill a particular need, perhaps an RB&W "special" can be developed that will.

BUSINESS PULSE

(*Continued from page* 98)

summer. The manner in which business weathered the steel strike was a healthy sign. If there had been serious hidden weaknesses in the situation, or if general confidence had been less strong, the interruption of steel output could have had serious effects on business as a whole. Actually, the economy emerged from the strike period with a minimum of loss.

Largely as a result of the strike, it appears, the Federal Reserve's seasonally adjusted index of industrial production dropped from 141 in June to 136 in July (1947-49 = 100). The decline reflected the loss of steel output, together with related decreases in production of coke, iron ore, and coal. Aside from these industries, which are closely allied with steel, the visible effects of the strike were very limited. In fact, activity in most durable-goods industries rose somewhat in July. Production of machinery and most other types of producers' equipment increased, as did output of consumers' durable goods.

Incomplete reports for August indicate that industrial activity as a whole was on the rebound, although it is questionable whether the prestrike level was fully regained, since the process of reactivating steel-making plants necessarily takes time.

Employment High

Employment also showed only minor effects, except in the steel industry itself. The Census report, which counts strikers as employed, gave a total of 66.7 million gainfully employed in July. This is a new high record, 150,000 above the June figure. The Bureau of Labor Statistics, which bases its employment totals on payrolls and therefore excludes strikers, showed a decline in nonfarm employment of more than 700,000 but attributed the drop primarily to the strike and observed that otherwise "evidence of strength was widespread in trade, finance, and service, as well as in most durable goods manufacturing industries."

Retail trade in July gave further evidence of strength. The special significance of this lies in the fact that during the early months of the year the relative sluggishness of consumer demand had raised serious questions as to the outlook for business in general and for the rate of investment in particular. Since business concerns invest in capital goods only in order to produce more consumer goods, a lag in consumer demand naturally brings up the question why capital expansion should continue. If retail trade had responded unfavorably to the steel strike, this question might have become critical. Fortunately, this was not the case. Consumer demand held at excellent levels, at least through the strike period, maintaining the improvement that had been reported in May and June.

Rise in Activity

It seems to be generally believed that business activity will tend to rise rather than decline during the remainder of the year. There are several strong supports for this view. One of these is the strike itself, which resulted in the loss of upwards of ten million ingot tons of steel and in many cases repleted the inventories of steel users to an appreciable extent. In consequences, spokesmen for the industry are apparently confident that operations will continue at or

(*Turn to page* 160, *please*)

ROTABS Beat Precision Inspection Costs...

This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.

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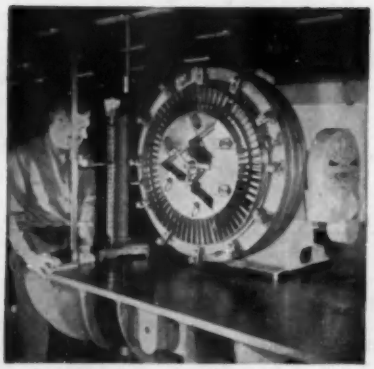

Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.

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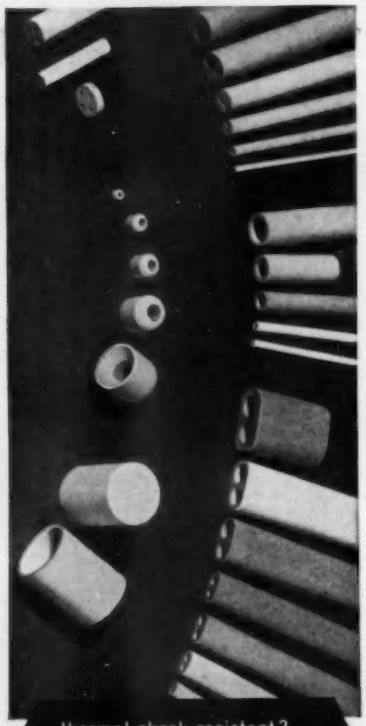

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BUSINESS PULSE

(*Continued from page* 158)

close to capacity for the remainder of the year.

Another important element of strength in the outlook for business in general is the more favorable position of the automobile industry. Cutbacks in production have held the output of cars closely in line with current demand, with the result that dealers will enter the new model season in a much stronger inventory position than they enjoyed a year ago. The more extensive model changes to be introduced this year should tend to stimulate consumer buying. The moderate sales level of 1956 is in some respects an encouraging factor, since it means that many potential buyers have now had two years or more to liquidate the indebtedness incurred for their previous purchases. Even should the initial response of consumers fail to measure up to the most optimistic expectations, production for inventory should hold operations at a high level for several months to come.

Whether these stimulating factors suffice to raise the general level of business activity in the closing months of the year will depend on a number of contingencies—the continuance of the investment boom, the level of Governmental demand, the volume of consumer spending, the amount of residential construction, and the possible effects of the higher money rates.

Three Executives Move Up At Federal-Mogul-Bower

Three top level executives of Bower Roller Bearing Div. have been elevated to new positions by Federal-Mogul-Bower Bearings, Inc., in the first major personnel change since Federal-Mogul and Bower merged in July 1955. Under a newly formed corporation setup, Russell E. Strickland, former general manager of Bower, has been made vice-president in charge of sales for the entire corporation.

The other two appointments include Frank E. Halderman, formerly controller of Bower, who was named general manager of Bower, and William E. Calder, director of industrial relations of Bower, who will assume additional duties as executive assistant to Halderman.

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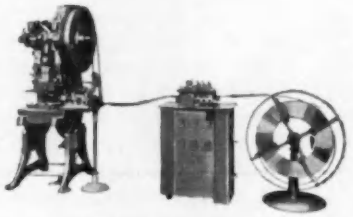
Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

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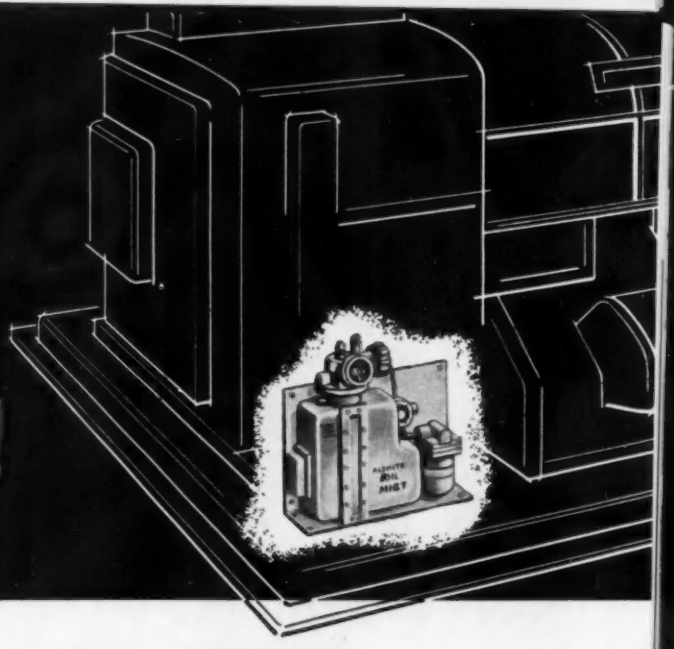

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Alemite Oil-Mist Automatic Lubrication brings remarkable savings... in lubricants, man-hours, bearing life, and decreased product spoilage.

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1. **Continuous Lubrication**—Constantly deposits fresh, clean film of oil on all surfaces of all bearings in the system.
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3. **Elimination of Guesswork**—No bearing can be over-looked, nor over-lubricated! Every bearing picks up only as much Oil-Mist as it needs.
4. **Reduction of Bearing Temperatures**—Acts as bearing coolant, can lower bearing temperatures as much as 20° F.
5. **Reduction of Types of Oil**—Reduces number of oils that must be stocked, handled, and applied.
6. **Elimination of Downtime**—All bearings in the system are constantly lubricated while machines continue to operate.
7. **Extension of Bearing Life**—Multiplies bearing life many times. Life of grinding machine bearings has been extended from 400 to 7,000 hours!
8. **As High As 90% Less Oil Consumption**—Alemite Oil-Mist usually consumes about 1/10 the amount consumed by any other oiling method!

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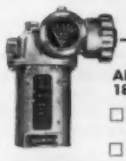

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Reduction of Cavitation Pitting of Diesel Engine Cylinder Liners

By J. A. Joyner, Asst. Chief Engineer

Internal Combustion Engine Section, Govt. and Industrial Products Div.
STUDEBAKER-PACKARD CORP.

DAMAGE to the water side of cylinder liners which until recently has been classified as chemical or electrolytic attack is now being recognized in many instances to be associated with mechanical action defined as cavitation pitting.

Many excellent papers have been written on cavitation pitting, but the majority of these cover laboratory work on materials or deal with the problems as encountered in pumps or hydraulic turbines. These papers are helpful to the diesel engine designer, but they do not apply directly to his specific problem.

With the increase in demand for more hp per pound of engine, it is necessary to work all materials a little nearer to their endurance limit. Unfortunately, in the case of diesel engine cylinder liners, the increases in deflection which results from the higher stresses can cause damaging cavitation pitting although the material is not being worked near its endurance limit.

There are at least two types of cavitation pitting. One type is associated with the formation and collapse of vacuum bubbles created at or near the surface of the material when the absolute pressure in the area drops below the vapor pressure of the liquid. The second type is caused by pressure waves being transmitted through the liquid. There are no vacuum bubbles associated with the second type; yet, the damaged surface has the same general appearance. This paper deals with the type of cavitation pitting where vacuum bubbles do exist.

Recent Endurance Tests

Three multi-cylinder endurance tests have been conducted on the Model 1D-1700 twelve-cylinder engine during the past year. Some cam ground pistons and two-piece heavy wall nickel-chrome plated cylinder liners have been used in each of these tests, and none have ever pitted. One of the tests was conducted with a split cooling system. A 40 per cent Prestone solution was used in one bank and 1 per cent chromate solution, consisting of 0.25 per cent dichromate and 0.75 per cent sodium chromate, was used in the other. Each bank had two cam ground pistons and four standard pistons. All positions were equipped with two-piece heavy wall nickel-chrome plated cylinder liners. All four of the liners with standard pistons in the Prestone inhibited bank were pitted, whereas only one of the liners with standard pistons was pitted in the chromate inhibited bank, and that was a very small pit; however, the chrome inhibitor does not appear to be compatible with the aluminum even when a low pH (8.0 to 8.5) is maintained and cannot be recommended for use with aluminum in the presence of steel.

Conclusion

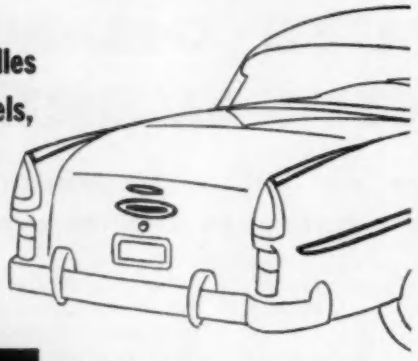
1. Control of piston clearance is the most effective method of reducing pitting on Diesel engine cylinder liners.

(*Turn to page* 164, *please*)

Here's the most effective, low-cost lock nut to

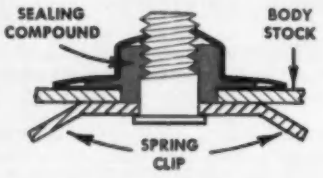
Seal out Water, Dirt and Dust

when fastening emblems, moldings and handles on rear deck, quarter panels, rear fenders, roof, etc.



SEALER TYPE
PALNUT
Trademark®
WASHER LOCK NUTS

PALNUT Sealer-Type fasteners combine the functions of a nut, a lock washer, a flat washer and a sealer washer in a one-piece fastener. Essentially these are PALNUT Washer-Type fasteners with a resilient, clean plastisol compound bonded securely to the washer face. Body enclosures are effectively sealed against water and dust seepage. Significant cost savings and high speed assembly are achieved with PALNUT Sealer-Type Fasteners.



ADVANTAGES

Positive sealing. As nut is tightened, hollow hex design forces sealer around screw threads and into stud clearance hole.

Maximum thread sealing. Hollow hex, single-thread design allows several threads to be sealed.

Bonded sealer does not distort or come off during shipment or assembly.

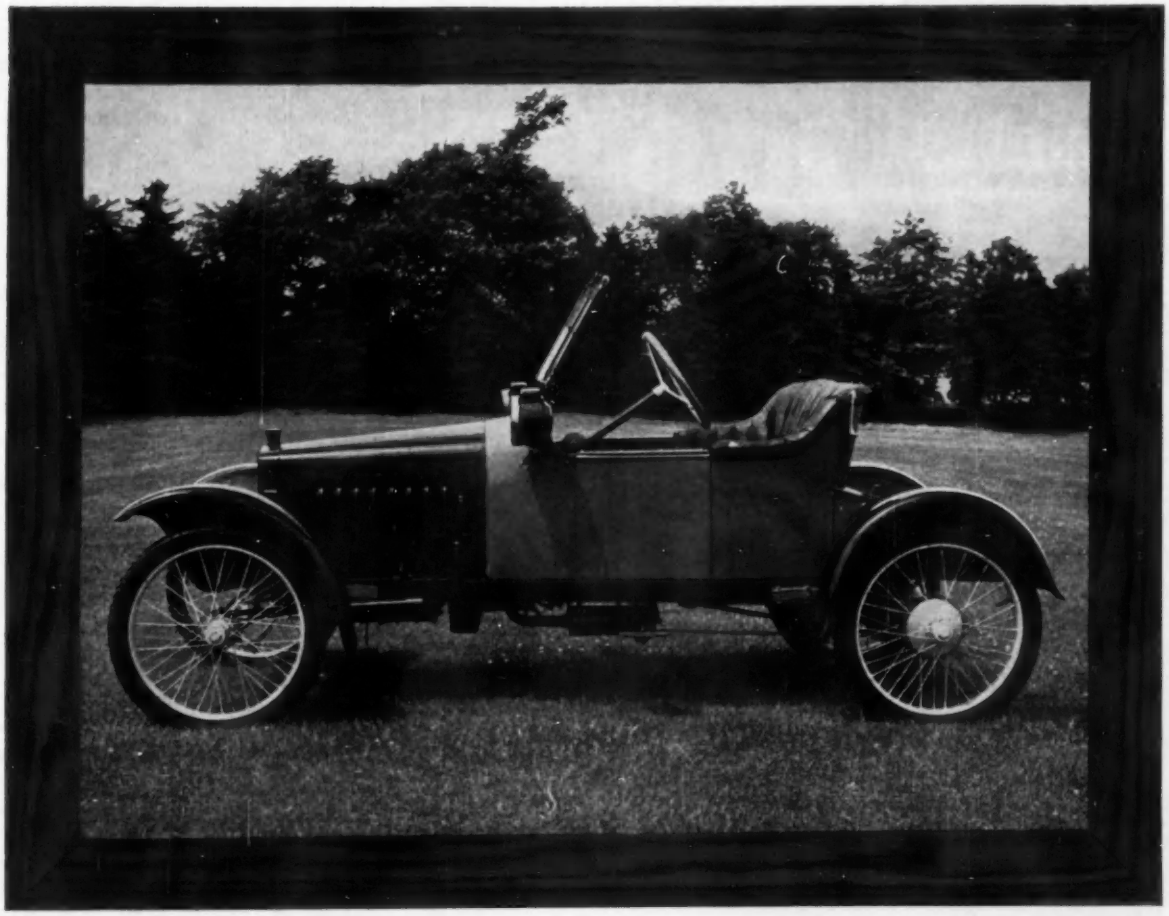
Easy starting. Sealer does not bind in the threads; permits finger starting.

Resilient locking action avoids stud damage and body dimpling.

Write for free samples, details sizes, prices.

The PALNUT Company
60 Glen Road, Mountainside, N. J.

Regional Sales Office
748 West Eight Mile Road
Detroit 20, Mich.



Send for free print—1914 Saxon Runabout, Model A.
Reprinted by permission—P. S. de Beaumont; not for commercial use.

At $395, the 1914 Model A Saxon Runabout was called "the poor man's light car." It had a 96-inch wheelbase, two-speed transmission, and featured standard tread wheels instead of the very narrow ones then in vogue on cyclecars.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing. Morse Chain Company, 7601 Central Avenue, Detroit 10, Michigan.

18 out of 22 automobile manufacturers specify Morse Timing Chain Drives

Ever since mechanical horsepower began replacing nature's variety, the Morse Chain Company has supplied the auto industry with its precision-built Timing Chain Drives.

Fact is that today, eighteen out of the twenty-two automotive manufacturers using timing chains, actually *specify* Morse Chain Drives as original equipment.

More than 60,000,000 of these drives have already gone into cars, trucks, and buses—giving vehicle owners long service life, plus freedom from maintenance worries. Morse Timing Chains operate safely, quietly, and smoothly—with positive timing.

Investigate Morse Timing Chain Drives . . . and the other precision-built power transmission products which Morse manufactures. We have expert engineers always available to help you in your power transmission requirements. Write, wire, or phone us, today, for quick assistance on your particular problem.

MORSE CHAIN COMPANY: DETROIT, MICHIGAN; ITHACA, NEW YORK.

MORSE MORSE B-W *trademark **POWER TRANSMISSION PRODUCTS**

TRU-O-SEAL
TEFLON SEAL
STOPS PIPE THREAD LEAKS instantly!
PAT. PENDING
Prevents future leaks!
TRU-O-SEAL does away with messy pipe "dope" compounds, eliminates damage caused by overtightening of conventional leaky joints, and is immune to ALL known hydraulic fluids and to steam, air, water, solvents, and practically all gases and chemicals. It withstands temperatures from —100° F. to plus 500° F., saves cost and labor of special or welded fittings, and has been fully field tested and proven by leading manufacturers. Comes in ⅛" to 2½" pipe thread sizes.
Write for data and prices
TRU-O-SEAL DIVISION
Flick-Reedy Corporation
2028 N. Hawthorne Melrose Park, Ill.
"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.
1 Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed). SEAL SIDE
2 Thread pipe or fitting 4 threads into port. Point in desired direction.
3 Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).

We invite you to see Our Exhibit at

BOOTH #1623
METAL SHOW
Oct. 8-12

PUBLIC AUDITORIUM
CLEVELAND

one source

with years of experience,
proven ability
and adequate facilities
to handle your
complete automation program.

serving industry since 1931

Pioneer ENGINEERING & MANUFACTURING CO., INC.
Telephone - TWinbrook 3-4500
19675 John R Street, Detroit 3, Michigan

Reduction of Cavitation

(*Continued from page* 162)

2. Nickel-chrome plate has very good resistance to cavitation pitting attack.
3. High frequency vibration amplitudes in excess of 3 mils are extremely difficult to protect.
4. Amplitude of vibration can be reduced by increasing cylinder wall thickness.
5. Inhibitors are beneficial.

• • •

Means for Reducing Coolant Side Corrosion of Diesel Cylinder Sleeves

By A. K. Blackwood
INTERNATIONAL HARVESTER CO.

COPPER-CHROMIUM, and nickle-chromium-molybdenum iron sleeves heat treated to the same hardness, Rockwell C45, as the unalloyed iron sleeves were tested, with a resultant greatly reduced rate of corrosion. Although corrosion was not entirely eliminated, the rate of deterioration was reduced sufficiently so that the rate of wear on the ID again became the limiting factor in sleeve life. No change in piston, ring or sleeve performance was observed with this material change. A production change to copper-chromium iron has varified these findings. No case of corrosion has been observed in laboratory engines since the change was instituted in 1949, and field complaints have practically ceased

Surface Finish and Application of Protective Coatings

A wide variety of coatings were tried in an endeavor to provide a protective film either mechanically or by the formation of a passive film on the coating itself. Coatings of copper plating, aluminum paint, casting sealers, phosphates, primers, hard film rust preventives, and baked on lacquer were used. While all of these coatings offered initial protection, most of them lost their effectiveness after short periods of time due either to erosion by the water flow or cracking due to sleeve deflection.

Treatment of the Coolant Medium by Inhibitors

An inhibitor has the facility of reducing the corrosion rate of any

(*Turn to page* 168, *please*)

Now...moisture-free air for air brake systems

New Wagner moisture ejection valve keeps reservoirs clean and dry—*automatically!*

Since moisture accumulation in the brake system can be a problem, you'll be interested in this fully automatic moisture ejection valve.

Operating at 15 to 20 p.s.i. pressure, it ejects moisture with each average brake application.

It mounts in any convenient location ... no heating element is necessary as the valve cannot freeze in open (exhaust) position. It connects to the air system by two air lines—one leading from the bottom of the air reservoir and the other from a brake application line.

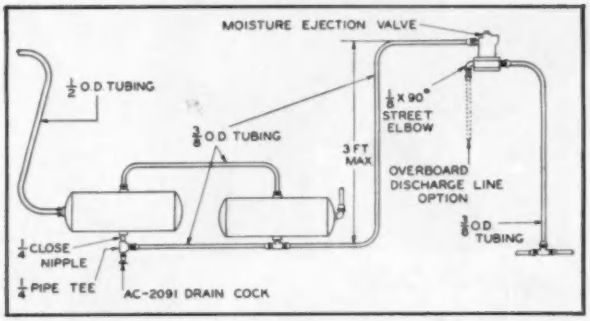
Expulsions occur without a noticeable drop in tank gauge pressure.

HIGH CAPACITY—valve can eject up to 4 fluid ounces at a time ... even expels foreign particles which may have settled to the bottom of the tank.

CORROSION RESISTANT metal parts. Diaphragms are a combination of neoprene and nylon cord for long life and high resistance to oil.

OPEN TO ATMOSPHERE—valve fluid cavities are open to atmosphere ... it is impossible to trap moisture within the unit. *Cannot balance in open position* ... and "dump" reservoir pressure.

TYPICAL PIPING DIAGRAM



Wagner Air Brake Application Valves for Straight Air Systems

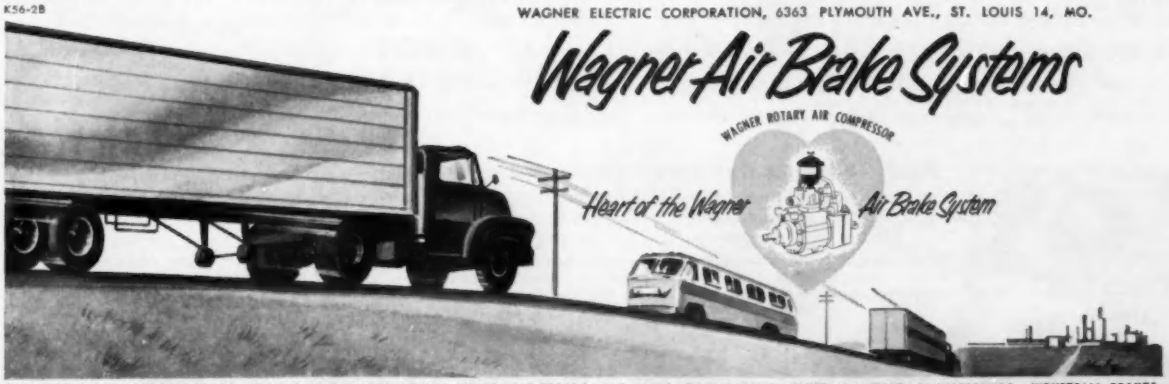
Actuating Arm Type | Treadle Type | Basic Type

These valves provide complete braking control for safe, sure stops. Each valve is completely interchangeable with other makes of valves. The basic valve can be installed by simply transferring the actuating mechanism to the Wagner valve. The treadle valve can be adjusted to angle properly with the contour of the floor board and also offers external adjustment of exhaust valve clearance.

For complete information on Wagner Air Brake Systems, write today for Catalog KU-201A.

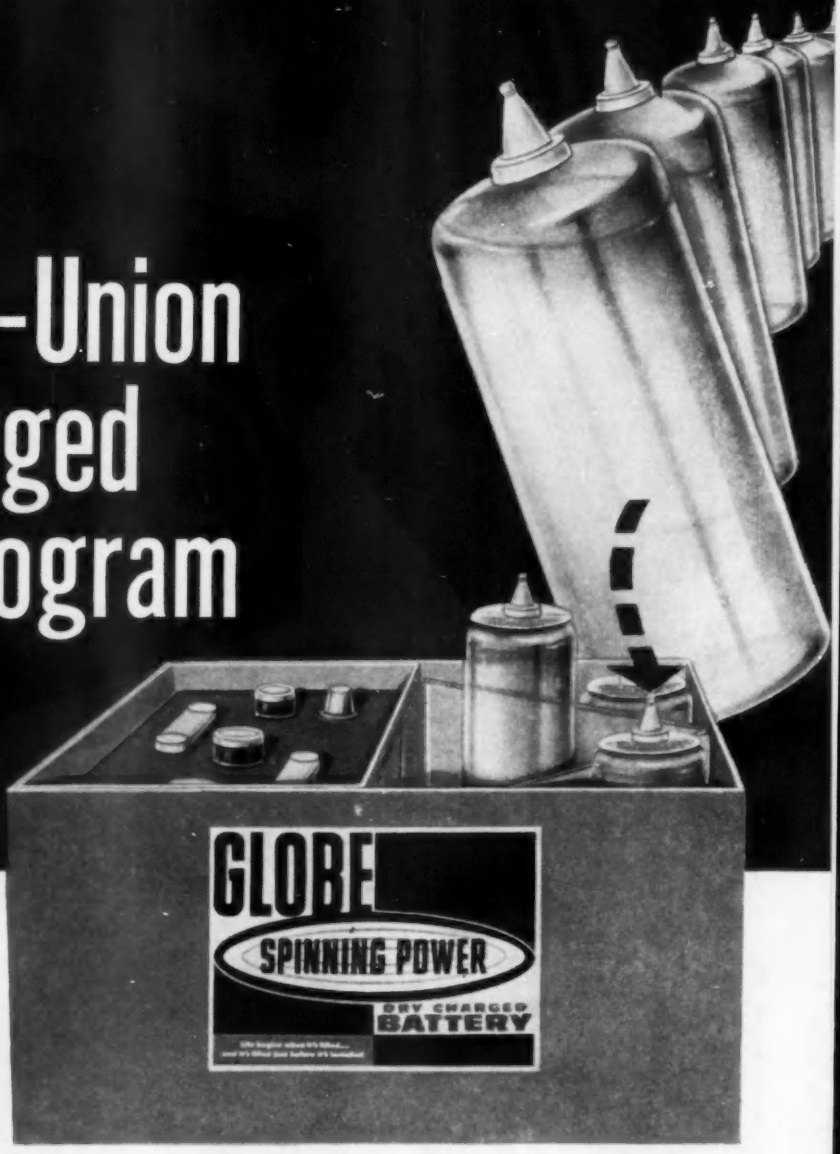
K56-28

WAGNER ELECTRIC CORPORATION, 6363 PLYMOUTH AVE., ST. LOUIS 14, MO.



LOCKHEED HYDRAULIC BRAKE PARTS and FLUID • NoRoL • CoNoX BRAKE LINING • AIR BRAKES • AIR HORNS • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

New Globe-Union dry-charged battery program



Gives you

- *lower shipping cost*
- *easier handling*
- *handier stocking*
- *safer activation*
- *faster delivery*

All this in a self-selling package!

New ease of handling and stocking — that's what Globe dry-charged battery program extras offer you! These investment-protecting benefits are wrapped up in a single eye-catching, self-selling display carton that stacks easily . . . provides fast, accurate, on-the-spot inventory control . . . makes it easy to set up traffic-stopping floor or window displays. Each carton is complete in itself — contains battery . . . lightweight, disposable electrolyte bottles . . . and a safety-insuring handling sleeve.

Fast, low cost delivery! Thirteen* of 16 Globe battery plants are equipped for dry-charged battery production . . . are strategically located so that fast, low-cost shipments can be provided for all markets.

Battery plants at: *HOUSTON, TEXAS *MEMPHIS, TENN. *ATLANTA, GA. *DALLAS, TEXAS *MEDFORD, MASS. *MILWAUKEE, WIS. *MINERAL RIDGE, OHIO *PHILADELPHIA, PA. *EMPORIA, KANSAS *REIDSVILLE, N. C. *SAN JOSE, CALIF. *LOUISVILLE, KY. *HASTINGS-ON-HUDSON, N. Y. — LOS ANGELES, CALIF. — OREGON CITY, OREGON — AJAX, (ONTARIO) CANADA

SPINNING POWER
GLOBE-UNION
SPLIT-SECOND STARTING

GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

Safe, convenient, easy activation

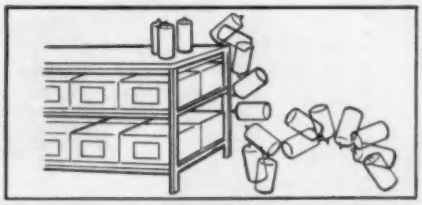
Seamless plastic bottles are easy to hold, pour without splashing

PLAX

Service men are highly enthusiastic about Globe's use of these super-light Plax plastic bottles. Seamless and unbreakable, they're easy to grip in one hand. Spout guides electrolyte accurately into the battery in an even, splashless stream. What's more, Plax containers' light weight saves substantial sums on shipping charges.

Like Globe, you may find that light, unbreakable Plax plastic bottles will make your product easier and safer to use — more dynamic to merchandise. In addition to polyethylene, Plax also blow-molds bottles of many other plastic materials, including butyrate, vinyl and nylon. For complete details on plastic bottle packaging — call or write Plax.

Disposable — After "fast, easy control" filling — merely rinse out bottle, slit, crumple and toss it in rubbish can.



Tough, rugged — Hundreds of impact tests prove Plax bottles' great strength minimizes chance for breakage or leakage. Bottles are warm to the touch...easy to grip...won't slip.

PLAX corporation

P. O. BOX 1019, HARTFORD, CONNECTICUT

IN CANADA: PLAX CANADA, LTD., MONTREAL AND TORONTO

PLAX

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

(*Continued from page* 164)

material when added in small quantities to the corrosive medium. The function is that of forming a protective film or keeping it in repair. Only chromate types of commercially available inhibitors were tested. These were found to offer a considerable amount of protection when the chromium content was maintained at 31-32 mg per 100 ml and the alkalinity (ph factor) at 9.5-10.5 as recommended by the manufacturers. This solution, however, was not considered satisfactory since it was too dependent upon maintenance by the operator. In stationary operations such as generating plants, this may represent a feasible means of keeping down corrosion, but in the operation of road machinery, too many variables are present. It has been shown by other investigators "that the addition of insufficient chromate to stifle completely oxygen-type corrosion of iron will cause serious intensification of the attack." Our own tests have shown that where chromate treated water is used with certain permanent type anti-freezes, heavy deposits are formed in the hotrest areas of the water jacket with resultant increases in metal temperatures in these areas.

Revision in the Engine Design

Since our tests indicated that two accelerating factors, high watervelocity and sleeve deflection, were present in the areas of corrosion, our studies were confined to revising these conditions. The heat pattern in the cylinder sleeves has been studied and it has been shown that very little change in temperature occurs, due either to large changes in water flow rate above the minimum requirements or to the pattern of flow over the sleeves. Thus it was possible to equalize the rate of flow over the whole sleeve area and greatly reduce the rate in the area of corrosion without affecting sleeve performance.

To study the deflection in sleeves, the effect of piston-to-sleeve clearance, piston taper, sleeve out of roundness, sleeve twist and clearance between sleeve and case were observed. It was found in one instance that by holding each of these to a minimum the deflection in the sleeve could be reduced by as much as 50 per cent. It is realized that other factors such as scuffing and scoring, lubrication oil control, adequate clearance during periods of abnormal operation, production tolerances and many others must be considered in the design of these parts. However, if the above factors are given consideration during the development period some reduction in sleeve deflection will probably result. A study of the data obtained in the numerous tests conducted in this investigation indicated a definite trend toward reduced corrosion with reduced clearances and taper. Other investigations have shown changes that will minimize the forces causing this deflection.

(1) Off-center position of the wrist pin.

(2) Longer piston skirt and

(3) Increased rigidity of piston and cylinder.

RING GEAR MARKING?

IT'S FAST, ACCURATE, FULLY AUTOMATIC

WITH THIS

GTS

Model 175-S

This GTS machine marks ring gears with serial numbering, fixed marking, or both in one operation. It is fully automatic, requiring no operator for loading, work, or discharge. Production rate is 1600 per hour.

Parts are fed from an inclined chute to the machine chute, from which they are loaded to a retractable stud arbor. Gears are handled swiftly and safely; all movements of the fixture are operated from a master hydraulic circuit and are therefore automatically synchronized.

FOR FURTHER INFORMATION on this machine, or expert assistance with any industrial marking problem, consult your nearest GTS representative, or write direct.

IF IT'S WORTH MAKING, IT'S WORTH MARKING.

GEO. T. SCHMIDT, INC.

4110 Ravenswood Avenue Chicago 13, Illinois

BOOKS ...

DIRECTORY OF AMERICAN AUTOMOBILE DEALERS, *published by B. Klein & Company, 27 East 22nd St., New York 10, N. Y. Price, $20.00.* This volume, the first of a projected four-volume directory listing over 40,000 automobile dealers, covers 8,000 Ford-Lincoln-Mercury dealers. Names and addresses of dealers are listed by state, and then alphabetically by cities within each state. Volume II of the complete directory will list General Motors Corp. dealers; Vol. III, Chrysler Corp. dealers; and Vol. IV, all other American and foreign car dealers.

Let all these sealing engineers help you design-in oil seals

Why "do it yourself?" Why chance the wrong seal? Why risk costly retooling or remanufacture because an unforeseen condition rendered an oil seal helpless?

The finest oil seal counsel anywhere is yours for the asking. Just pick up the phone and call the nearest National Oil Seal Engineering office. You'll get complete, current information on newest seal developments, plus the help of the entire National Oil Seal Engineering group. Field and factory, these men devote their entire lives to seals. They have seen literally thousands of sealing problems through to a successful solution.

Let National's three decades of sealing experience help you. Call now.

Specify seals at the drawing-board stage—always!

NATIONAL MOTOR BEARING CO., INC.

Plants at Van Wert, Ohio, Redwood City, Downey, Long Beach, Calif.

General Offices at Redwood City

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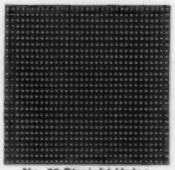
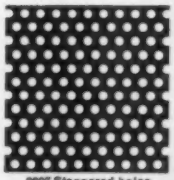
Perforated Materials for *Every* Application

Contact H & K for any perforated materials your product may require.



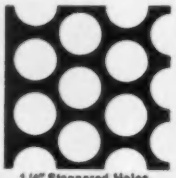
No. 00 Straight Holes
932 holes per sq. in.
.020" diam. 30% open.



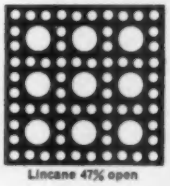
.060" Staggered holes.
128 holes per sq. in.
3/32" centers. 36% open.

We have tools for perforating thousands of different patterns.

We will be glad to work with you on your perforating problems.



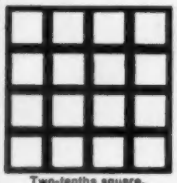
1/4" Staggered Holes.
5/16" centers.
.25" diam. 58% open.



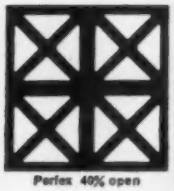
Lincane 47% open

See our catalog in Sweet's Product Design File.

Perforating all metals, Masonite, plywood, paper, cloth and plastic.

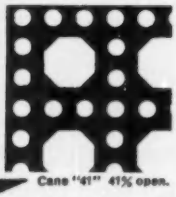


Two-tenths square,
64% open.



Perfex 40% open

Round holes, square holes, slots, ornamental patterns, oblong holes, oval holes.



Cane "41" 41% open.

Fill-in and mail coupon to office and warehouse nearest you.

THE **Harrington & King** PERFORATING CO.

Chicago Office and Warehouse
5630 Fillmore Street
Chicago 44, Ill.

New York Office and Warehouse
106 Liberty Street
New York, N. Y.

Please send me—

- ☐ GENERAL CATALOG NO. 62
- ☐ STOCK LIST of Perforated Steel Sheets
- ☐ SAMPLES of Perforated Plastics and Paper
- ☐ PRICE INFORMATION (NOTE: Send specifications of perforated materials wanted. If necessary send drawings or sketches.)

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

Industry News

(*Continued from page* 152)

Sizable Contracts Are Awarded By Air Force to Three Concerns

Three firms will share Air Force contracts awarded recently by the Air Materiel Command at Wright-Patterson Air Force Base, Ohio. Largest of the three contracts, totaling $4.9 million, has gone to Avco Manufacturing Corp.'s Lycoming Div. at Stratford, Conn., for additional R1300-3A and R1820-103 engines and data.

Wright-Aeronautical Div. of Curtiss-Wright Corp. received $1.5 million for overhauling J-65 jet engines, and the Ingersoll-Rand Co. facility in Birmingham, Ala., was awarded $2.4 million for an undisclosed type of operation to be performed at the company's plant at Painted Post.

Permatex President Exhorts Industry To Train Mechanics

An appeal to educators and the automobile industry to take prompt action in relieving the current shortage of automobile mechanics was voiced recently by C. A. Benoit, Jr., president of Permatex Co. He cited some interesting figures which point up the seriousness of the present shortage.

He noted, for example, that there is only one mechanic for every 83 vehicles in operation, and that 30,000 additional mechanics will be needed annually to maintain even that low ratio. Only about one-third that many mechanics are being graduated from vocational schools annually at present.

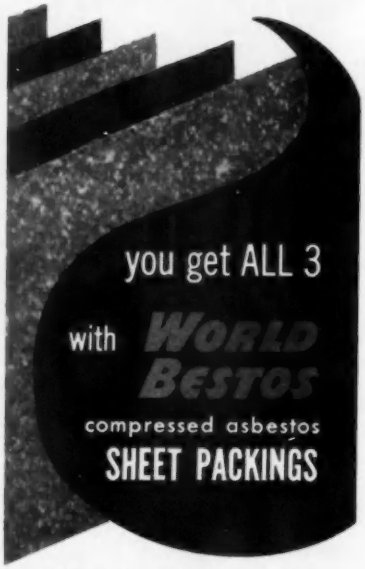
Chrysler Study Shows Type Of Music Motorists Prefer

While ear-shattering "Rock-and-Roll" music continues high on the popularity list of teen-agers, the motorist is finding enjoyment in a more tranquil type of music, according to a report from Chrysler Corp. The study, designed to find out what type of records motorists are selecting for the Hi-Fi record player Chrysler introduced on its cars, shows that the biggest sellers are records which feature "mood music." These consist generally of popular and standard tunes which have been arranged in a semi-classical style. As for "documentaries," newscaster Edward R. Murrow's "I Can Hear It Now" is on top of the popularity list.

GASKET CUTTERS

—"supply" is no problem when you can count on

- PROVEN QUALITY
- ON-TIME DELIVERY
- COMPETITIVE PRICES



● World Bestos Packing Division of Firestone offers a dependable source of supply for finest quality sheet stock . . . using specially compounded binders of neoprene, GRS synthetic rubber and natural rubber.

World Bestos' modern equipment and ample plant capacity assure on-time delivery . . . at competitive prices. Firestone's extensive research and quality control facilities assure formulations and finished sheets of proven quality and uniformity. World Bestos is now supplying leading gasket cutters with sheets manufactured to S.A.E. and government specifications. Stocks are carried to meet emergency needs.

Write today for complete information on your requirements. Engineering assistance is available.

WORLD BESTOS
NEW CASTLE, INDIANA
PACKING DIVISION OF THE
Firestone
TIRE AND RUBBER CO.

Q • What constitutes a dependable • source of metal powder parts?

A:

If the source is strong in experience, ability and good judgment —like Moraine Products—it cannot miss being dependable.

Moraine Products has the experience gained from the production of hundreds of millions of metal powder parts in an infinite variety of shapes and sizes. Moraine Products has the engineering and metallurgical ability to design parts for specific applications so that they can be produced most economically—usually in one press operation. And, finally, Moraine Products has the good judgment to recognize the limitations as well as the advantages of metal powder in each proposed application.

When we accept an assignment to make a part from metal powder, it is only after thorough conviction that our material and our process are best suited for the job the part will ultimately be expected to perform for the customer.

Moraine Products also produces: Moraine Power Brakes—Delco hydraulic brake fluids, brake assemblies, master cylinders, wheel cylinders, and parts—Moraine friction materials —Moraine-400 and M-100 automotive engine bearings—self-lubricating bearings and porous metal filters—rolled bronze and bi-metal bushings.

Another General Motors Value

Moraine Products

Division of General Motors, Dayton, Ohio

Car Air Conditioner Sales†

RELATIVELY good statistics are available on sales of air conditioners in the U. S. as a whole. Sales in 1954 and estimated sales in 1955 may be summarized as follows:

Air Conditioners	1955*	1954
Factory Units	121,904	36,469
Independent Units	55,000	21,000
TOTAL	176,904	57,469

*Estimates for full year based on sales through July, 1955.

It is significant that the totals for factory installed units in Ford, Chevrolet and Plymouth were zero in 1954 and only 18,602 in 1955.

Other sources have generally verified these data and have indicated that the future market for these units is expected to be good in the southern U. S. from Florida to California and extending north to St. Louis in the Middle West.

Estimates of 1956 sales have ranged from 250,000 to 500,000 compared to 176,904 in 1955. A representative of Kelvinator Division of American Motors has been quoted as predicting production of one million units per year in 1959, and a representative of General Motors has been quoted as predicting that one million or more General Motors cars will be air conditioned by 1961 or 1962.

The foregoing have been correlated in Fig. 1. Extrapolation I appears to be too high, and Extrapolation III appears to be too low, particularly in the 1956-1957 period. Extrapolation II agrees well with the forecasts and indicates the following:

Year	Air-Conditioned Cars For Year (Thousands)	Air-Conditioned Cars Total* (Thousands)	% of Cars Air-Conditioned All Cars†	% of Cars Air-Conditioned New Cars‡
1951	2	2	....	....
1952	5	7	....	0.1
1953	20	27	0.1	0.3
1954	57	84	0.2	1.0
1955	176	260	0.5	2.5
1956	300	560	1.1	5.0
1957	450	1,010	1.9	8.0
1958	700	1,710	3.1	12.0
1959	1,000	2,710	4.8	17.0
1960	1,400	4,110	7.0	23.0
1961	2,000	6,110	10.1	33.0

* Assuming no scrapping of air conditioners in this period.

† Based on NPN Factbook estimates (May, 1955) of total registrations: 50 million in 1955 to 60.5 million in 1961.

‡ Based on new cars produced through 1954 (Wards Factbook). Estimate for 1955 was 7 million; production in 1956-1961 was assumed to be 6 million per year.

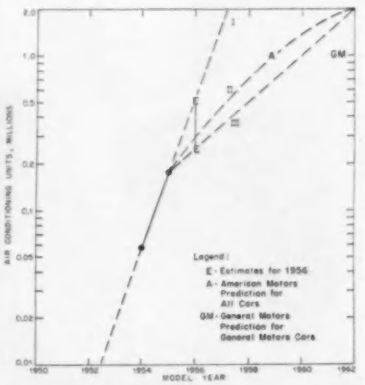
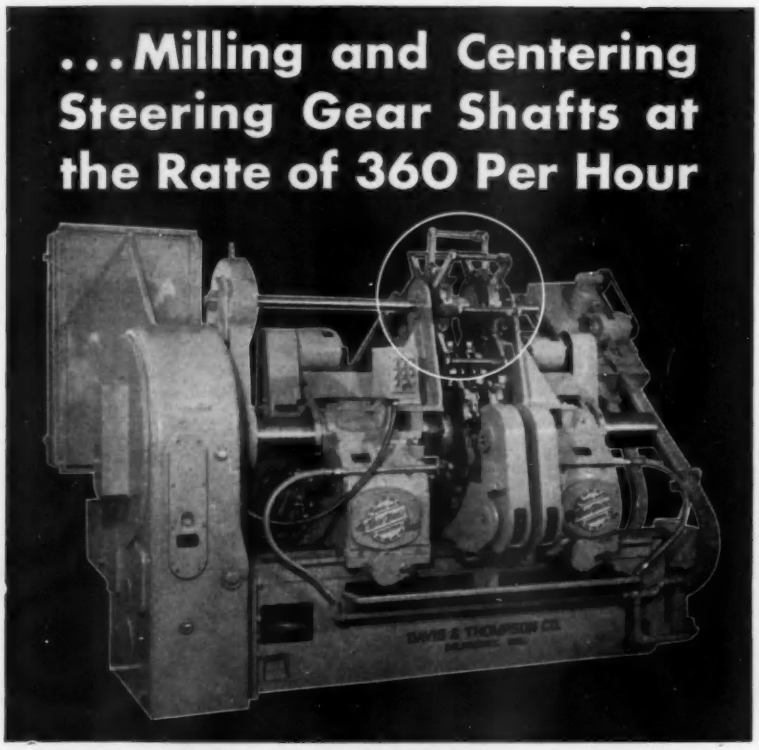

AIR CONDITIONING UNITS, MILLIONS
MODEL YEAR
GM
Legend:
E - Estimates for 1956
A - American Motors Prediction for All Cars
GM - General Motors Prediction for General Motors Cars

Fig. 1—Car air conditioner estimates

It has been reported that between one-third and one-half of all automotive air conditioners sold to date are in Texas. Surveys conducted in major Texas cities have indicated the following.

Cars	Estimated Texas 1955 Car Sales	Air-Conditioned %	Air-Conditioned Total
Class I: Ford, Chevrolet, Plymouth, etc.	290,000	10	29,000
Class II: Pontiac, Olds., Mercury, Dodge, etc.	140,000	30	42,000
Class III: Buick, Packard, Lincoln, Cadillac, Chrysler	20,000	80	16,000
TOTAL	450,000	19	87,000

These data would indicate that 49 per cent of U. S. automotive air conditioners sold in 1955 are in Texas. For Texas as a whole, this is high because the per cent values shown above



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

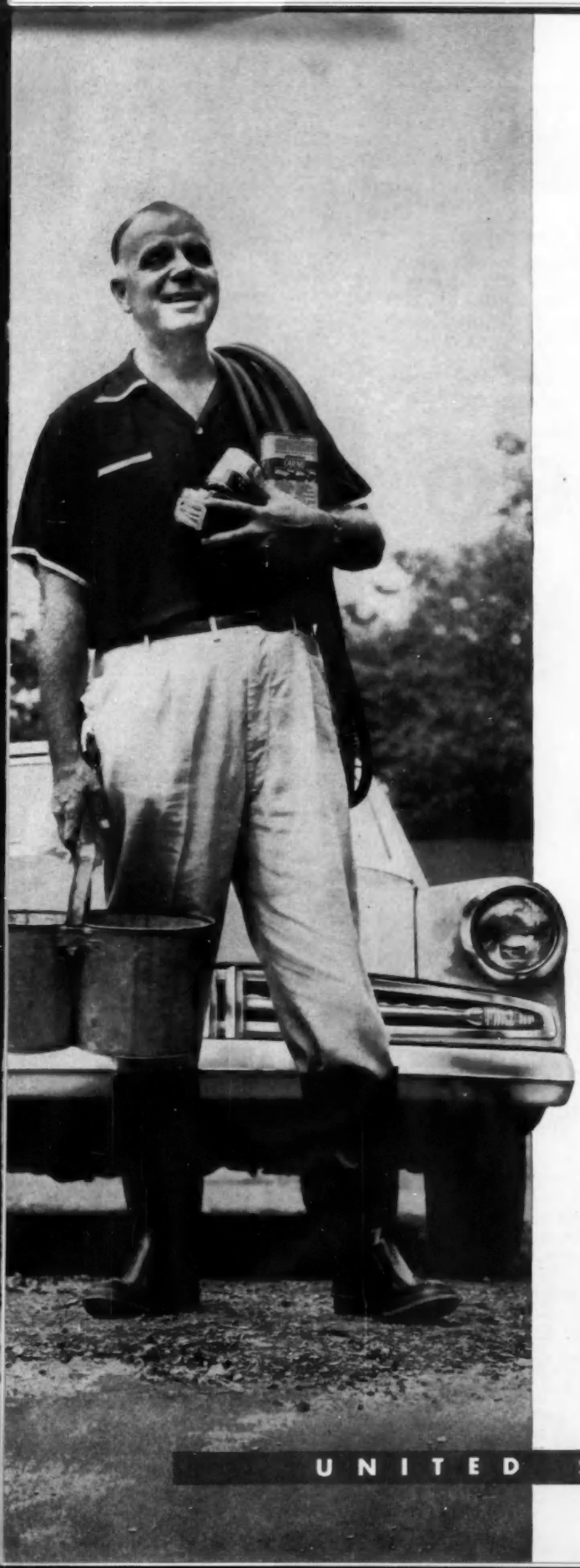
Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 10, WISCONSIN



"I, sir, wash my own car!"

This car washing is a great American hobby. As soon as one man starts, you find the whole neighborhood outside, kinking the hose, sloshing through puddles, having fun. They wield an incredible array of long-handled brushes, sprays and mops, assisted by a witches brew of foaming detergents, cleaners, waxes, powders, pastes, liquids and creams.

When the car is washed, the man of the house begins an inch-by-inch check of the glittering trim. Does it really shine? Or does it blister? Or peel?

People are proud of their cars, and they want them to stay bright. If your dealers can assure prospects that the trim will resist corrosion and denting like nothing else, you might furnish that nudge that clinches a sale.

When your trim is made from Stainless Steel, you can make these promises in all good faith. People know what Stainless is, for they use it every day in the form of flatware, pots and pans, sink tops and the like.

The beauty is more than skin deep when you use trim made from service-tested USS Stainless Steel. There's a size and finish for every possible need.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

UNITED STATES STEEL

are known to be lower outside of the major metropolitan areas (Houston, San Antonio, Dallas-Fort Worth). A more realistic total number is believed to be 60,000 or one third of total sales.

It is concluded from the foregoing that the effects of automotive air conditioning gasoline volatility requirements must be considered today in marketing gasolines in Texas and must be considered generally within one to two years.

† *The foregoing extract is from the paper, "Automotive Air Conditioners and Gasoline Volatility Requirements," by M. R. Morrow, Humble Oil and Refining Co.*

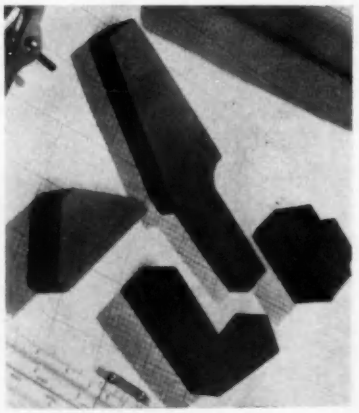
NEW PRODUCTION and PLANT EQUIPMENT

(*Continued from page* 87)

Shaped Tool Steel

THE availability of a wide variety of tool steel shapes is promised in an announcement stating that a company has successfully hot-extruded tool and high-speed steels of various grades. For manufacturers who have been machining their tools from round, square, or rectangular bar stock, the use of extrusions will reportedly permit reductions in machining time on many applications, as well as reductions in scrap loss.

The adaptation of the hot extrusion process is said to offer advantages over rolling, forging or casting. The



Typical extruded tool steel shapes produced by Allegheny Ludlum

design and operation of the extrusion press permit flexibility. Die costs are small and new dies can be prepared on relatively short notice it is stated. The use of a swinging die arm in the press allows quick changeover between normal operation cycles of the press from one shape to another. Hot rolled tolerances are generally held; and the hot worked extruded structure has been found similar to rolled material.

Being offered are 20 of the company's standard tool and high-speed steel grades in the form of extrusions. The products are limited in size to a minimum of ½ sq in. cross-sectional area and to a maximum size of a section that can be inscribed in a four-inch diam circle. Tubular products are available, as well as shapes. Maximum product length in the unannealed condition is 40 ft, and in the annealed condition up to 12 ft. *Allegheny Ludlum Steel Corp.*

Circle 53 on postcard for more data

Brazing Flux

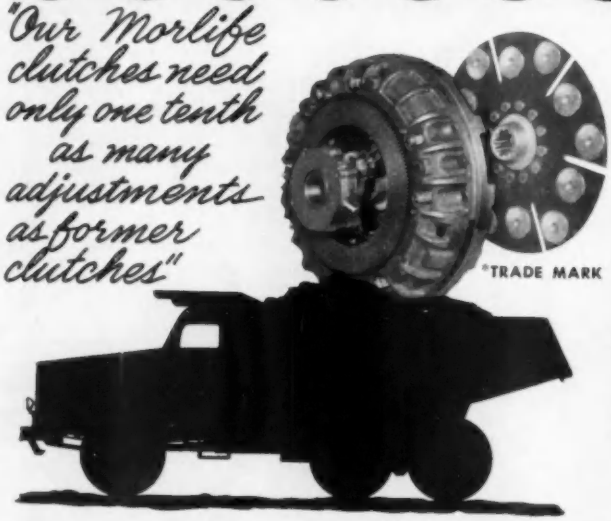
FOR high temperature brazing of stainless and other high alloy steels, a new paste type material called Nicrobraz flux has been intro-

(*Turn to page* 176, *please*)

ROCKFORD

"Our Morlife clutches need only one tenth as many adjustments as former clutches"

*TRADE MARK



"MORLIFE clutch has gone 851 hours without slipping or adjustment."

"MORLIFE clutch going strong after 1695 hours, working in sand."

"MORLIFE clutches last 950 hours longer, without adjustment."

"MORLIFE clutch needs adjustment once a month, instead of daily."

"MORLIFE requires lighter handle pull and one tenth the adjustments."

"MORLIFE pulls harder and lasts six to ten times longer."

"Won't buy a unit that isn't equipped with Durable MORLIFE clutch."

New MORLIFE* CLUTCHES and CLUTCH PLATES Give-

MORE Clutch Life (400% MORE)
MORE Torque Capacity (100% MORE)
MORE Heat Resistance (50% MORE)

These *new* ROCKFORD Clutches and Clutch Plates have been developed by ROCKFORD Clutch Engineers to take full advantage of recently discovered facing material. Actual field tests on heavy duty equipment have resulted in adoption of MORLIFE clutches by builders of tractors, earth movers, graders, shovels, cranes, trucks, oil field equipment and power units. For information how these *new* Rockford MORLIFE Clutches will improve the operation and increase on-the-job hours of heavy duty machines, write Department E.

ROCKFORD Clutch Division BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

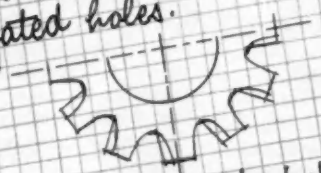
HOW A YOUNG DESIGN ENGINEER PUT BETTER QUALITY INTO HIS PRODUCT

No single type washer can do the right locking job on all applications!

We need the right washer for every job... LOCK washers that really LOCK... such as SHAKEPROOF'S job-tailored line

for example, among SHAKEPROOF'S nine standards, the countersunk lock washer keeps countersunk screws locked tight!... Or, use the dome type for soft or thin materials and oversize or elongated holes.

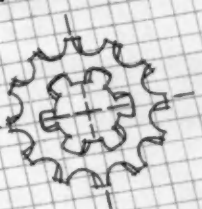
for special problems and special savings... SHAKEPROOF "Specials" have practically no limit in design or application!



All SHAKEPROOF® Lock Washers have tapered-twisted teeth that bite deep, set up strut and spring action to resist backward rotation, A PERFECT LOCK EVERY TIME!

So next time use SHAKEPROOF LOCK WASHERS

The "job-right" lock washer locks tight every time



Improve quality... CUT COSTS!

SEND FOR "SHAKEPROOF SAMPLER"

Write today for SHAKEPROOF LOCK WASHER samples and useful "How to Choose" booklet!

SHAKEPROOF

"Fastening Headquarters"®

St. Charles Road, Elgin, Illinois • Offices in Principal Cities
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FASTEX

DIVISIONS OF ILLINOIS TOOL WORKS
World's Broadest Line of Mass-Assembly Fastenings

THERE'S NO SUBSTITUTE
for LUBER-FINER'S
ENGINEERED
PROTECTION

YES! IT'S WHAT'S
INSIDE
THAT COUNTS
The Efficiency of Luber-finer's Exclusive Patented Process
HAS NEVER
BEEN EQUALLED!

USE ONLY GENUINE
Luber-finer
DIESELPAKS

Only a Luber-finer Unit Plus a Genuine Luber-finer Pack can give the Exclusive Patented Filtering Process that has made Luber-finer The Standard of The Industry Since 1936!!

THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE—EVERY TYPE OF OIL!!

LUBER-FINER PACKS AVAILABLE

1. REFINING PACK
Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPAK
First made available in 1941, the DIESELPAK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!
There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!
The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.
IT PAYS TO GET THE BEST!

STANDARD OF THE INDUSTRY SINCE 1936
Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.
Write for Complete Information to Dept. 3

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

NEW PRODUCTION and PLANT EQUIPMENT

(Continued from page 174)

duced. It cleans and promotes wetting of the surfaces to be joined, and helps dissolve oxides during the brazing action. The announcement states that: (1) it contributes to production of better joints on stainless steels and particularly when brazing difficult alloys such as Inconel X and other special alloys containing elements that place them high on the electromotive series; (2) it permits high temperature brazing with an oxyacetylene torch and without special atmospheres; (3) it permits the use of less expensive atmospheres when furnace brazing stainless steels and high chromium alloys; and (4) that it permits the brazing of titanium or aluminum bearing stainless alloys in hydrogen atmospheres.

The materal has a melting point below 1200 F and is recommended for brazing applications involving temperatures between 1600 and 2200 F. Within the recommended temperature limits, it will not boil or run off. Its cleaning properties reportedly enable it to dissolve or remove from stainless steels the oxides of chromium, aluminum and titanium.

The flux is specifically designed for use with Nicrobraz-type brazing alloys in high temperature operations to join high chromium alloys and stainless steels. Among the stainless alloys with which it can be used are those containing titanium and aluminum, such as Inconel X, Inconel W, 17-7 PH, Duranickel, K Monel, Nitraloy, A286, S816 and Nimonic 80. Nicrobraz flux can also be used for the brazing of carbon steels, chromium iron alloys and copper. *Wall Colmonoy Corp.*

Circle 54 on postcard for more data

Centering Machine

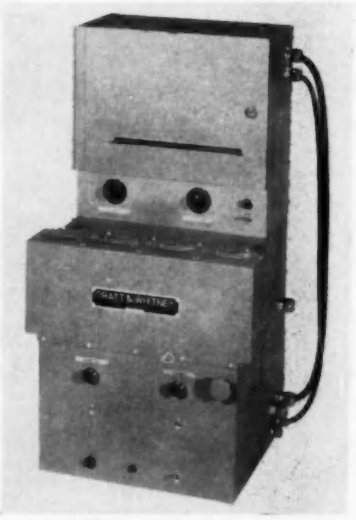
DESIGNED to perform a centering operation on such parts as camshafts at a high production rate, a new machine incorporates two opposed automatic drilling units. The operator merely loads the part into a fixture and depresses the start cycle switch, whereupon the work is automatically clamped, centered at both ends and unclamped, ready for the operator to remove. Production rate is approximately 360 pieces per hour.

By making minor changes, the machine can reportedly be adapted to a variety of parts. *Govro-Nelson Co.*

Circle 55 on postcard for more data

Printing Strip Analyzer

DEVELOPMENT of a production analyzing totalizer that prints a card record of the on-gage and off-gage footage of rolled strip metal was recently announced. The unit, operating in combination with either contacting or non-contacting continuous strip thickness gages, prints a permanent record in numerical, rather than chart, form—a feature sought by industry for record-keeping, for analysis and for later shearing operations.



Pratt & Whitney strip metal recorder

A typical installation on a finishing mill will accumulate the undersize, on-gage, oversize, and total footages in a coil on the last pass through the strip mill. At the end of the pass the operator inserts the standard production work card in the printer, and these footages as well as the time, the date, the coil number, the operator's number, and sets of tolerance zones, are imprinted for the permanent record. During this operation the counters are automatically reset for the next coil.

This card printer is actuated by a Model D classifying control, in conjunction with a contractor pulsed by the mill drive. The tolerance limits are adjustable to meet specific requirements. The card printer and totalizer unit is an accessory which may be added to both new and existing continuous gaging systems. *Pratt & Whitney Co., Inc.*

Circle 56 on postcard for more data

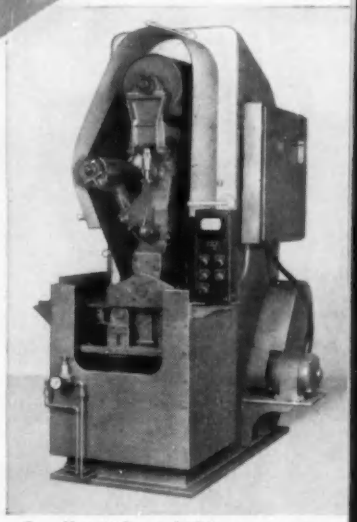
FLAT POLISH

Slash production costs EIGHT ways with MICRO-POLISH

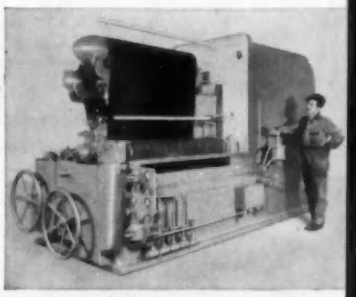
1. More square foot area can be pre-polished in a fraction of the time required for any type of contour polishing.
2. Cost per square foot is by far the lowest of all methods.
3. Use of lower steel grades rather than higher finishes give larger initial stock saving.
4. Improves press and die action.
5. Pre-polished steel (5-8 micro-inches) produces outstanding results with the most exacting, modern plating practices.
6. Pre-polished steel provides a uniform surface giving a plating deposition of maximum protection with minimum plating.
7. Prefinishing with subsequent forming produces lower unit cost.
8. Rejects due to base metal finishing are essentially eliminated.

"Complete Package"

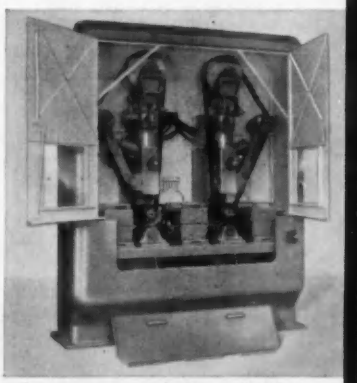
Murray-Way will engineer a complete automatic finishing line or a single machine to aid you in reducing your operating costs, improve finishes and increase production. For complete information—CALL OR WRITE



Small unit for polishing narrow strip or sheet stock.



A Micro-Polish giant used in reclamation grinding of steel strip.



Space saver unit for polishing flat bar stock. Two heads and two grades of belt grain accomplish the complete job without rehandling.

MURRAY WAY

MURRAY-WAY CORPORATION

P. O. BOX 180, MAPLE ROAD EAST · BIRMINGHAM, MICH.

Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

ONE "STOP" PROVIDES ALL...

-A COMPLETE STAMPING SERVICE!

Here at Ackermann-Wheeling, you will find skilled technicians capable of answering and carrying out the answer to any stamping problem – from drawing board to finished product. You'll find complete production facilities available: deep drawing, shearing, spot welding, arc welding, brazing, pressing, degreasing, painting ... everything needed to give your product a keen competitive edge. Write, wire or call for full details on Ackermann-Wheeling's services.

ACKERMANN WHEELING

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WHEELING, WEST VIRGINIA

Steel Stamping does it better ... Ackermann-Wheeling does it best!

NOW... rounding out this complete service—

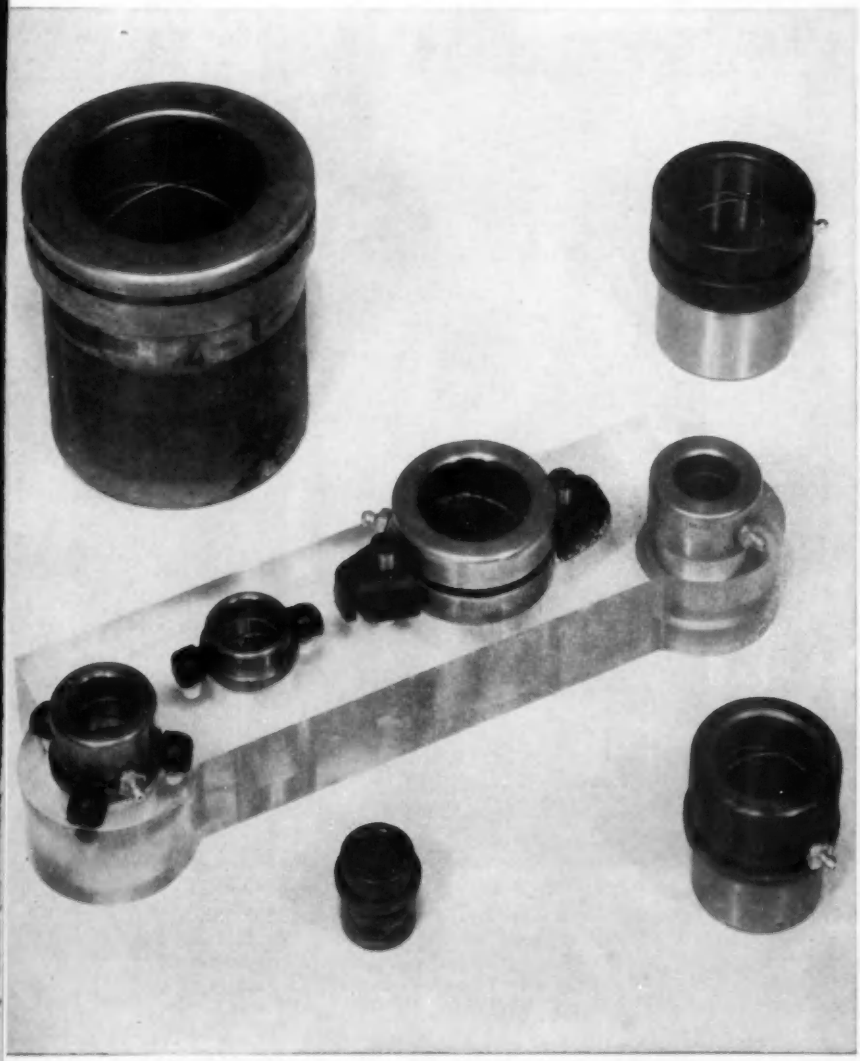
Ackermann **BAND-BOX** Steel Shipping Container...

to help you save on material handling!

It's the ideal solution to in-plant and inter-plant shipping and storing. Rugged, all-steel yet light weight; nestable parts assemble in seconds; self-palletizing and tierable. It's the most practical, versatile shipping container available. Engineered to specific requirements. For full details on the Ackermann BAND-BOX write, wire or call today.

How a better precision-fit Guide Pin Bushing* is made in less time with

SHELBY SEAMLESS MECHANICAL TUBING



Here is another manufacturer that is turning out a better product in less time by using Shelby Seamless Steel Tubing.

The product, a wring-fit bushing, makes possible a truly precision die set, which permits closer working tolerances and extends the life of the dies to a degree never before thought possible. The bushing itself is harder, stronger, more uniform, longer lasting and better fitting.

When Shelby Seamless Tubing is used, no boring is necessary—the hole is already there. It offers more, however, than just a pre-bored hole. It combines to an exceptional degree the qualities of strength, uniformity, and dimensional accuracy. These advantages, coupled with the workability and excellent machining properties of Shelby Seamless, make it the ideal material for critical mechanical applications like this.

Available in a wide range of diameters, wall thicknesses, various shapes and steel analyses, Shelby Seamless Mechanical Tubing is produced to exacting standards by the world's largest manufacturer of tubular steel products. Get in touch with our engineers if you would like help in applying Shelby Seamless to your specifications.

*Manufacturer's name on request.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

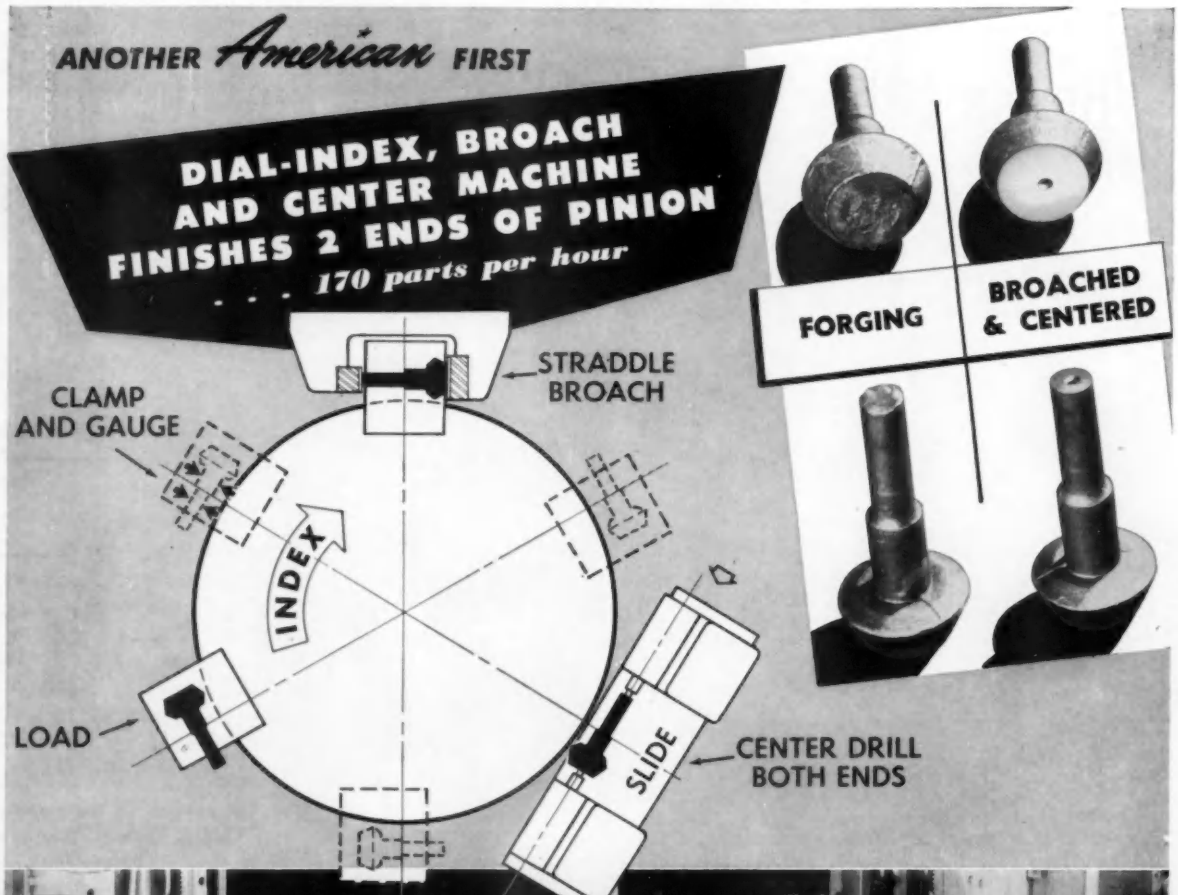
USS SHELBY SEAMLESS MECHANICAL TUBING

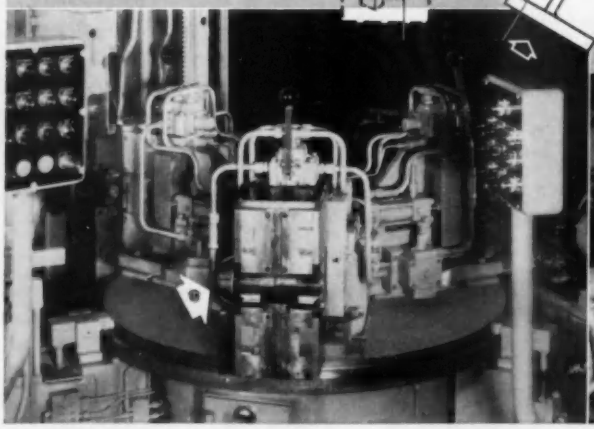
UNITED STATES STEEL

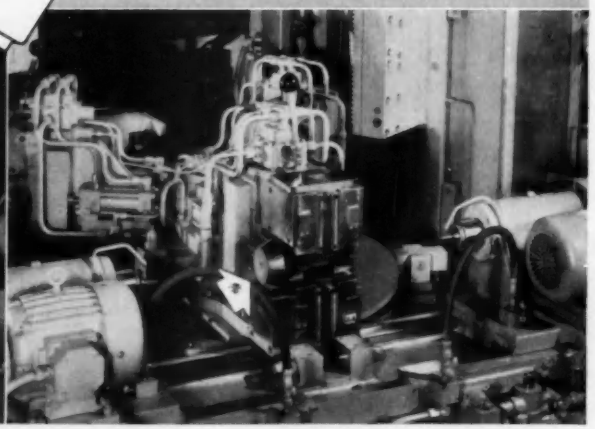
ANOTHER *American* FIRST

DIAL-INDEX, BROACH AND CENTER MACHINE FINISHES 2 ENDS OF PINION

. . . 170 parts per hour







Automative pinion forgings are loaded at this, the first of six stations on a dial-type indexing unit. At the next station, part is automatically clamped and gauged — oversize parts stop the cycle. At the third station, both ends of pinion are straddle broached.

While one part is being broached, both ends of another part are being center drilled at the station shown here. Broaching, drilling and dial indexing are interlocked and completely automatic. Operator has time to unload and reload fixtures as they index to him.

Write or 'phone details of your broaching requirements. Or write for Catalog 450.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

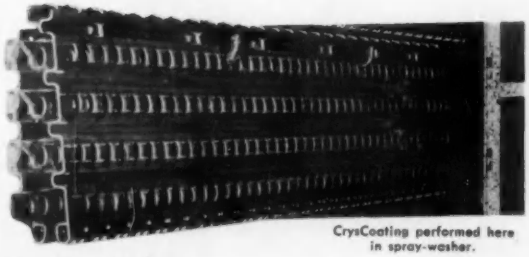
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

CrysCoat*

CLEANING-PHOSPHATING PROCESS

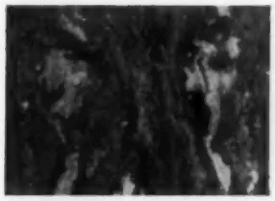
protects against rust

When you CrysCoat steel products, you form a heavy, phosphate coating *integral* with the surface. This CrysCoat protective coating blocks rusting, grips paint tenaciously. It stops corrosion from spreading under the paint film where damaged.



CrysCoating performed here in spray-washer.

prolongs paint life



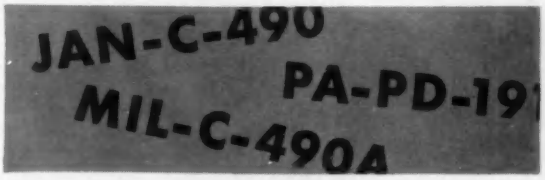
Panel A, painted without CrysCoating first, failed after 120 hours salt spray.

Panel B, painted over CrysCoat, shows no evidence of failure after 1200 hours.

Certain Government phosphating specifications require that a phosphate-coated and painted steel surface withstands 250 hours or more salt-spray testing without paint film failure. So successful is CrysCoat protection, that test panels, covered with ordnance specification finishes show no signs of blistering or peeling even after 1200 hours.

meets specifications

For military production, CrysCoat phosphate coatings exceed the minimum of 150 milligrams per square foot required under various Government specifications including MIL-C-490A, Grade I, and its predecessor JAN-C-490, Grade I; 57-0-2C, Type II, Class C and PA-PD-191, Rev. I, Grade I.



There's a CrysCoat Process for spray-washing machines and for immersion tanks. Details in Bulletin 8979. Write Oakite Products, Inc., Rector St., New York 6, New York.

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*A complete phosphating process by Oakite

FOR THE GIANT JETS...

scores of precision components

Through many years Kelsey-Hayes has worked closely with major aircraft engine builders. Today, with the addition of new plants, expanded research and engineering staffs, and augmented production facilities, assignments from the aviation industry are increasing rapidly.

Products include accessory gear assemblies, actuators, transmissions, power recovery units, radar tracking and scanning equipment, computers and controls. And for jets: compressor rotors, turbine sections, blades, buckets, vanes.

Kelsey-Hayes has the experience and facilities for research, design, prototype development and production.

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ENGINEERS...

LOOK TEN YEARS AHEAD!

Will your income and location allow you to live in a home like this... spend your leisure time like this?

A Douglas engineer lives here

ANALOG COMPUTING

Those with degrees in mathematics, physics and engineering are needed to solve interesting problems on direct analog computers and differential analyzers.

Knowledge of or experience in dynamics, stress analysis, servomechanisms, heat flow and circuit analysis or non-linear mechanics is helpful.

They can...if you start your career now at Douglas!

Take that ten year ahead look. There's a fine career opportunity in the engineering field you like best waiting for you at Douglas.

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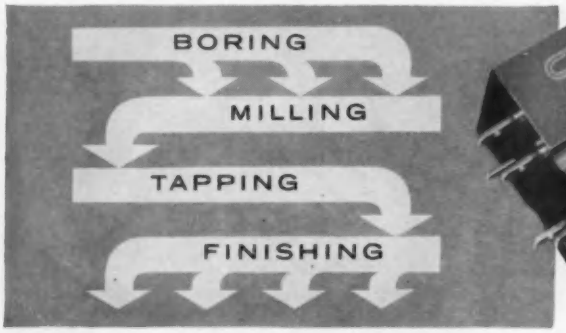
The Douglas Company's size and variety mean that you'll be in the work you like best—side by side with the men who have engineered the finest aircraft and missiles on the American scene today. And you'll have every prospect that ten years from now you'll be where you want to be career-wise, money-wise and location-wise.

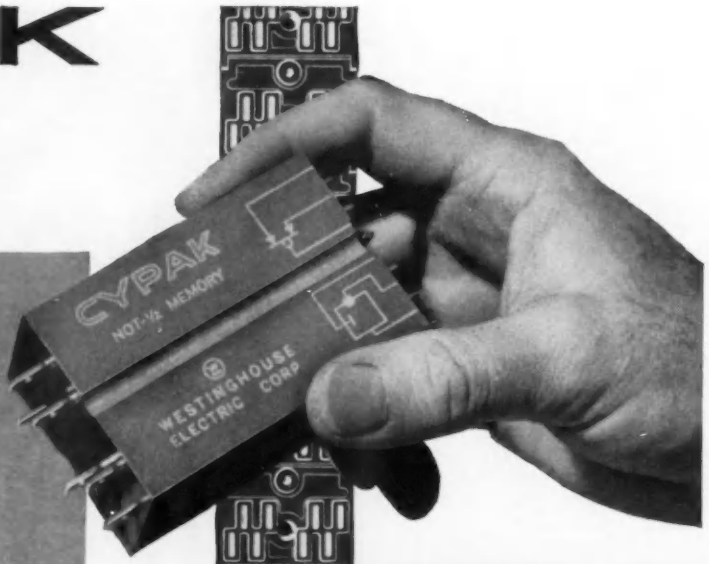
For further information about opportunities with Douglas in Santa Monica, El Segundo and Long Beach, California divisions and Tulsa, Oklahoma, write today to:

DOUGLAS AIRCRAFT COMPANY, INC.

C. C. LaVene, 3000 Ocean Park Blvd., Santa Monica, California

CYPAK
AT WORK...





simplifies automatic control of transfer machines

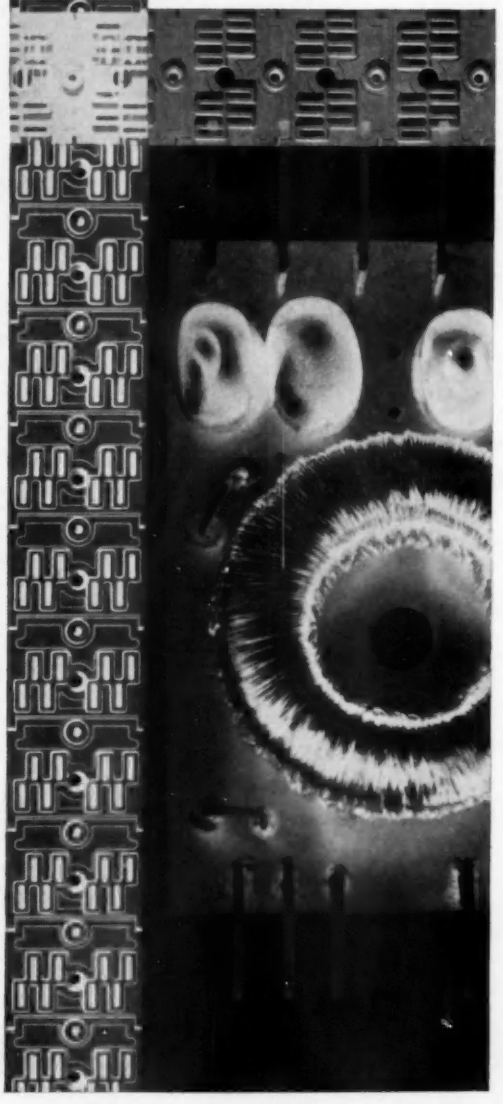
When you're considering the cost of transfer-type machining operations, look at the new areas of return from the simplicity of CYPAK* control systems. Transfer machine installations of CYPAK are proving two important facts.

First, CYPAK has made the first major change in simplifying industrial control reliability. The control elements have no moving parts to wear, corrode or jam. Conservatively rated, CYPAK life is many times longer than conventional relay systems. You can measure the savings in more continuous production . . . control replacement costs eliminated.

And second, CYPAK design greatly improves the physical simplicity . . . ease of inspection, addition, or change of transfer machine control. Each CYPAK element is encased in a protective plastic block. These are plugged-in—locked-in to a common power channel forming a compact, simply wired system.

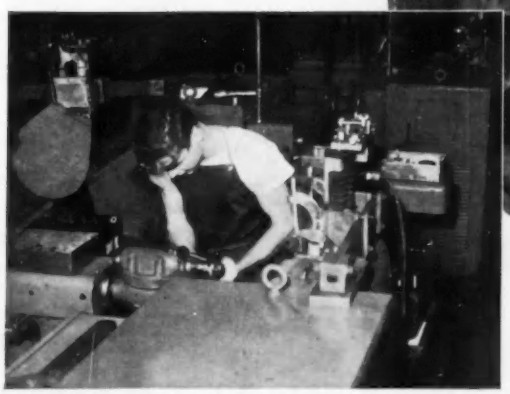
We'd like to give you further proof of CYPAK contributions to complex machine control. Your Westinghouse sales engineer has full reports on many different applications. Call him today or write Westinghouse Electric Corporation, Dept. B, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa. *Trade-Mark

J-21964

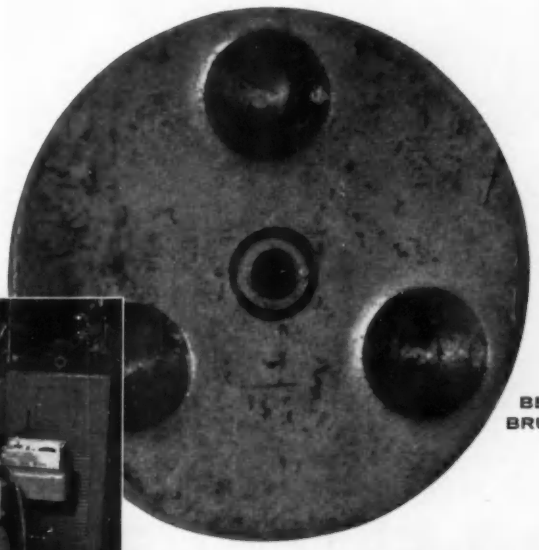


WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***



A manufacturer of computers and business machines improves the quality of precision components, greatly reduces costs using Osborn Brushamatic machines.



BEFORE BRUSHING

AFTER BRUSHING

Low price on high finish

A few years ago, precision parts were finished in custom lots at considerable cost. Today, Osborn power brushing methods put finer finishes on precision parts at mass-production rates.

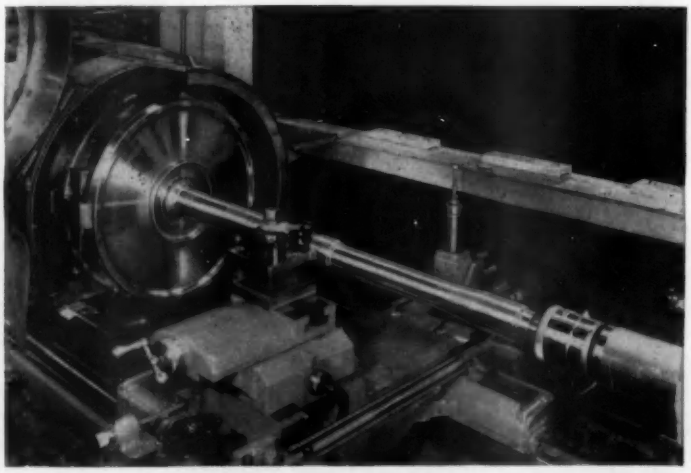
The business machine component shown above is typical. Brushamatic® Machines put a high, mirror-like finish on all flat and depressed surfaces of this ball retainer in just 25 seconds—*finish 6 parts for the former cost of finishing 1.*

An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, will show how *you* can use Brushamatic® methods to produce finer finishes at lower cost. Write THE OSBORN MANUFACTURING COMPANY, DEPT. E-45, 5401 HAMILTON AVENUE, CLEVELAND 14, OHIO.

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES



now

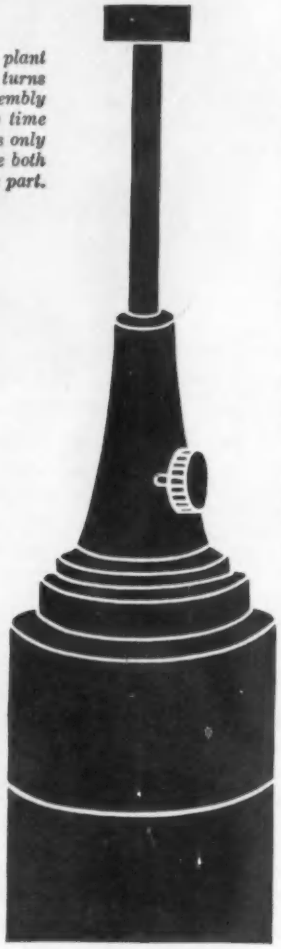
handle jobs impossible on a conventional tracer lathe . . .

with the **LODGE & SHIPLEY**

DUAL TRACER

Lathe and All-Hydraulic 360° Control

DUAL TRACER Lathe in plant of famous auto manufacturer turns all shaft diameters on a hub assembly for a turbine rotor. Machining time on this 54" x 4" diameter part is only 22.5 minutes. Also used to face both sides of the hub portion of this part.



On many types of work, conventional tracer lathes are limited in their ability to handle complex jobs. The Lodge & Shipley DUAL TRACER Lathe is a significant advance. It is designed to speed and simplify the duplication of complex curves on a lathe which can also be instantly changed over to standard lathe operation.

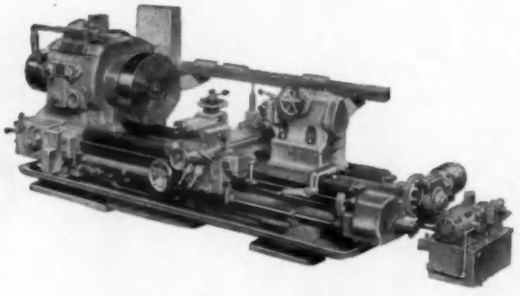
The most important application of the DUAL TRACER is in the machining of complex contours on the periphery, bore or face of a component.

Reduced to its basic elements, the DUAL TRACER Lathe consists of two (or dual) hydraulic motors controlled by the tracing stylus. One motor controls the rotation of the cross feed screw and hence the "in and out" movement of the cutting tool or tools. The other motor controls the rotation of the lead screw and hence the movement of the carriage along the ways.

Chances are the DUAL TRACER can do your job faster and more economically. Consult our sales engineering department. *For details, write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25 Ohio.*

Built by LODGE & SHIPLEY

- **LATHES**
- **HYDRAULIC PRESSES**
- **PRESS BRAKES**
- **SQUARING SHEARS**
- **FLOTURN MACHINES**



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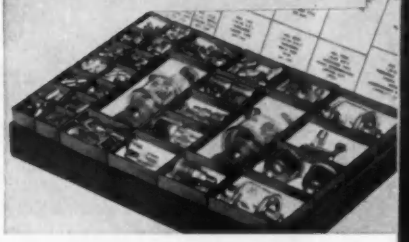
LUBRIKIT . . . An assortment of 95 oil cups of 29 different types. Gits sales records show these oilers are most used for replacement and maintenance. Contents of each separate bin are clearly described on Inside Cover.

Special Introductory Price
Just **$14.95** F.O.B. Factory
Satisfaction or your money back

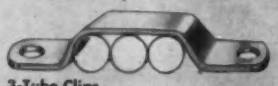


CLIPS FOR ATTACHING TUBING

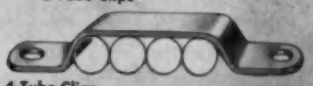
When ordering, specify ¼", 5/16" or ⅜" tubes. Style TF.

Single Clips

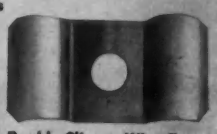
Double Clips



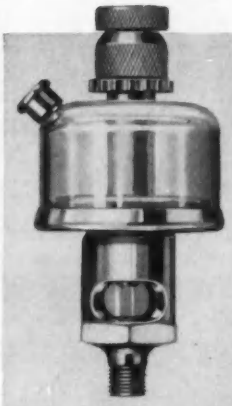
3-Tube Clips



4-Tube Clips



Double Clips — Wing Type



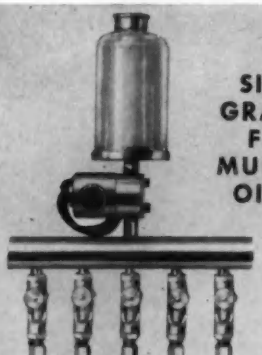
SIGHT GRAVITY FEED OILERS

Rate of oil flow regulated by needle valve, directly observed through sight glass in stem.

Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.

GEAR CASE GAUGES

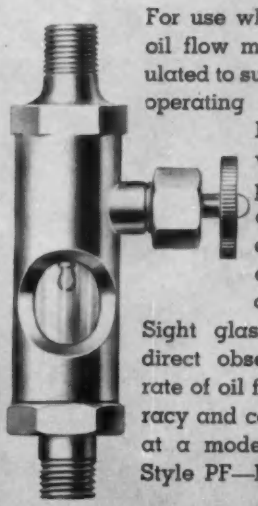
This oil gauge plug permits instant checking of oil level within a transmission or gear case. For use where construction permits insertion in tapped hole. A valuable addition to any such equipment — at very low cost. Style BW—No. 4042.



SIGHT GRAVITY FEED MULTIPLE OILERS

This one unit replaces 3 to 8 individual oilers. Maximum practicality in a small central lubrication system. Positive cut-off during idle periods. Individual vibration-proof needle valve adjustments. With solenoid control (Illustrated): Style MDS—No. 4685-A. Without solenoid: Style MD.

SIGHT GAUGES



For use where rate of oil flow must be regulated to suit changing operating conditions. Needle valve permits extremely accurate adjustment of oil feed. Sight glass provides direct observation of rate of oil flow. Accuracy and convenience at a moderate price. Style PF—No. 4290.

Don't price yourself out of the market. When you design proper lubrication into your equipment, specify GITS Lubricating Devices—the widest selection available anywhere. The items pictured above are only a few of our many thousands of lubricating devices. At the design stage, get the GITS story. Free Engineering Service. Send NOW for your free Catalog.

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The Standard For Industry For Almost Half A Century
1870 South Kilbourn Avenue
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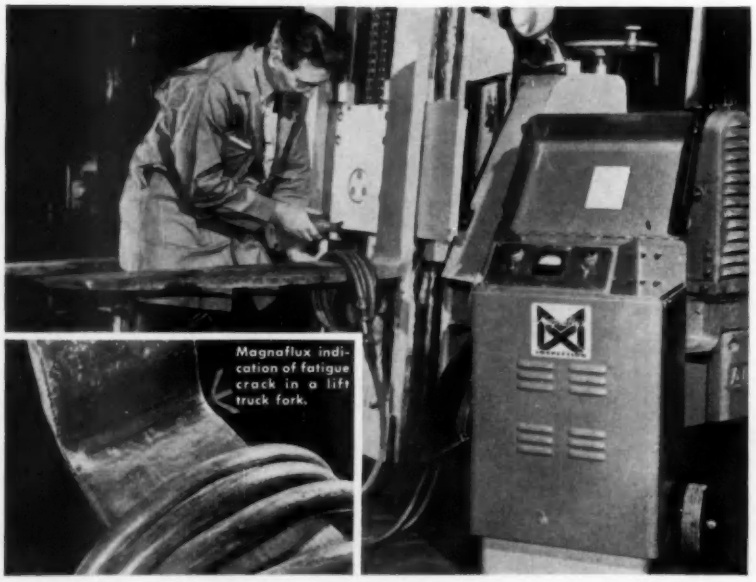
Clip this page for handy "rough reference"

Case Studies:
NONDESTRUCTIVE TESTING SYSTEMS

THE ELECTRIC DETECTIVE is an apt description of the Magnatest FM-100 Conductivity Meter. Magnatest uses the electrical conductivities of materials as a measure of uniformity, hardness, purity and other characteristics. A small hand held coil induces eddy currents in the test material, which in turn affect the impedence of the coil in proportion to the conductivity of the material.

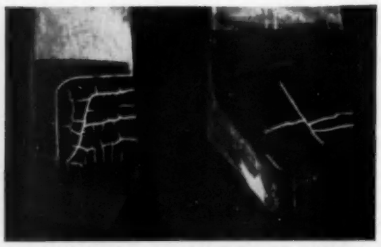


IT'S JUST A LITTLE CRACK, but it's a serious matter when it shows up on an industrial crane hook. In fact, to the naked eye it may appear to be a scratch, at most. Yet it can open further and further under load. The end result: failure in service and subsequent costly damage. Photo above shows a Magnaflux indication of such a crack in a crane hook.

How Periodic Inspection Ups Production by Preventing Equipment Failures

When industrial equipment fails in use, it usually results in lost time, production, or even life! In each case there is a corresponding loss of money. The amount, of course, depends upon the circumstances. Periodic inspection with an M testing system can foretell the exact nature and extent of structural weaknesses in your machinery, tanks, or equipment.

Invisible hairline cracks are warning signs of future fatigue failure. The M tests detect such signs in any material. You can take the proper corrective steps in time to prevent costly production interruptions. Nondestructive testing can help you eliminate profit-draining equipment failures. —Investigate Magnaflux inspection methods today!



ZYGLO "SPOTLIGHTS" SERIOUS DEFECTS IN CUTTING TOOLS

Zyglo inspection employs an oil base penetrant that is brilliantly flourescent under "black light". It detects surface cracks or pores when they may affect the service life of any metal part. Whether you produce cutting tools, or use them, Zyglo provides better inspection at lower cost.

THE HALLMARK OF THE BEST SYSTEMS FOR NONDESTRUCTIVE TESTING

MAGNAFLUX CORPORATION

Write for complete details concerning any of the above case studies, or ask for our new booklet on "Lower Manufacturing Costs."

Take Your Inspection Problems to the House of Answers

MAGNAFLUX CORPORATION

7304 West Lawrence Avenue • Chicago 31, Illinois

New York 36 • Pittsburgh 36 • Cleveland 15 • Detroit 11 • Dallas 19 • Los Angeles 58

No. 4685-A. Without solenoid: Style MD.

Clip this page for handy "rough reference")

Installation of the most modern equipment, doubling our engineering and other specialized personnel are but some of the factors contributing to our newly increased productivity and efficiency.

Long's experience in quality manufacture includes over a half century of volume production for American industry. The progressive policies of Borg-Warner—of which we are a Division—set new goals in expanding our engineering and production service.

We direct you to the advantages of meeting your cost and delivery requirements through recent developments and new applications of our products. We're eager to tell you about them in detail.

LONG CLUTCHES SET INDUSTRY STANDARD

Continous design advances have maintained Long's leadership in clutch manufacture. This company developed the double plate clutch when it entered the field in 1922.

Double plate models in sizes from 11 in. to 17 in. provide greater gripping area, without increased diameter. They're dependable under all operating conditions.

This Long double plate 11 in. clutch permits handling the high torque demands of today's and tomorrow's engines without increasing bell housing size. It is built for heavy-duty service.

Long-originated design features provide improved ventilation, lower pedal pressure and increased flexibility.

MODEL 11-211

LONG B-W BORG-WARNER

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LONG MANUFACTURING DIVISION, BORG-WARNER CORPORATION

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(Advertisement)

MORE EFFICIENT DESIGN, IMPORTANT SAVINGS, SIMPLIFIED ASSEMBLY, BETTER APPEARANCE

These are some of the many benefits reported by Design Engineers who have adopted TRU-LAY PUSH-PULLS for remote control operations on literally hundreds of products

Here are typical comments recently received from equipment manufacturers whose machines or implements are equipped with these accurate and dependable remote controls:

Saves Time, Labor and Material
"The use of your flexible Push-Pulls saves us a great deal of time, labor and material. The old linkages frequently required much planning in both engineering and shop which is not required now. On some of our equipment we use Push-Pulls from 10 to 30 feet in length. They operate clutch controls on the Main Power Unit, Feed Conveyors and Delivery Conveyors."

Greater Flexibility of Design
"The principal advantage of Tru-Lay Push-Pulls in our application is that they permit flexibility in locating the control valve in relation to the operator's position."

Cost Less to Install
"Tru-Lay Push-Pulls are easier and less expensive to install than linkages for remote control of power take-off, brake and clutch. Better appearance, too."

Simple and Neat
"For several models of farm tractors, we selected your controls for their simplicity and neatness of application as governor controls."

Solution to Tough Problem
"Can be installed where straight rods are impossible . . . for Remote Control of transmissions, brakes and clutches."

Eliminates Maintenance
"Simple operation and elimination of maintenance problem are the major advantages in using your Push-Pulls."

Reduces Number of Parts
"Your Push-Pulls have eliminated links, radius rods and other lost-motion devices for remote control of hydraulic valves."

Provide ACCURATE Control
"Tru-Lay Push-Pull control cables provide minimum back-lash, even in installations up to 30 feet in length, because the cable is designed to close tolerances with minimum drag and lost motion."

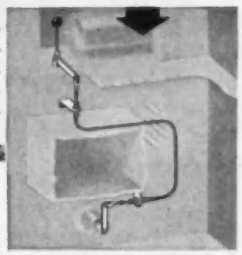
• • •

TRU-LAY PUSH-PULLS are "Solid as a rod but *Flexible* as a wire rope." This flexibility makes it possible to snake around obstructions . . . permits the ideal arrangement of all elements of remote controls.

***Advantages** of Tru-Lay Push-Pull flexibility and simplicity are pictured below—*

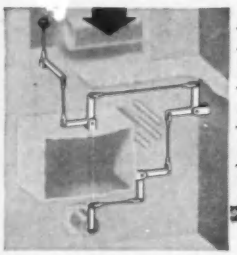
TRU-LAY PUSH-PULL

Simple
One Moving Part
Life-Time Service
Life-Time Accuracy
Low over-all Cost
Noiseless



MECHANICAL LINKAGES

Complex
Many Parts
Many Points of Wear
Increasing Back-Lash
Loss of Accuracy
Vibration
Rattles



Construction Equipment and **Farm Implements** provide good examples of the wide-spread use of these accurate, simple and dependable Push-Pulls. On Power Shovels, Winches, Graders, Road Oilers, Dump Trucks, Snow Plows, Engine-driven Pumps, Crushers, Tractors, Combines, Corn Pickers, Corn Row Sprayers, Corn Detasslers, Orchard Sprayers, Power-driven Tree Trimmers, Tobacco Picking Machines and others . . .

TRU-LAY PUSH-PULLS are operating unfailingly for the remote control of Hydraulic and Air Valves, Brakes, Clutches, Transmissions, Throttles, Chokes, Governors, Power Take-Offs, Spray Nozzles, Vent Directional Fins and on many other applications.

ACCO *Our DATA FILE will answer all further questions*

AUTOMOTIVE and AIRCRAFT DIVISION
AMERICAN CHAIN & CABLE

601H Stephenson Bldg., Detroit 2
2216H South Garfield Ave., Los Angeles 22 • 929H Connecticut Ave., Bridgeport 2, Conn.

There is No Worry about Failures or Maintenance Costs with TRU-LAY Push-Pull Remote Controls

Long Life is a matter of record. We have never heard of a Tru-Lay Flexible Push-Pull Control wearing out in normal service. Failures, that sometimes harass users of more complex controls, are eliminated by the use of these simple, positive-action controls.

Dependable Operation of these controls is a certainty, even under the most adverse conditions . . . HOT as jet engines (note: Tru-Lay Push-Pulls are actually performing on hot jet applications) . . . COLD to 70° F below zero . . . SOAKIN' WET . . . ABRASIVE . . . or just plain TOUGH.

Freedom from Trouble is assured because of such features as . . . full protection of the inner, working member by the tough flexible conduit . . . lubrication of the inner, working member *for life* during assembly . . . seals that keep moisture, dust and other foreign matter out of the unit . . . cold swaging of fittings that makes them integral parts of the control unit.

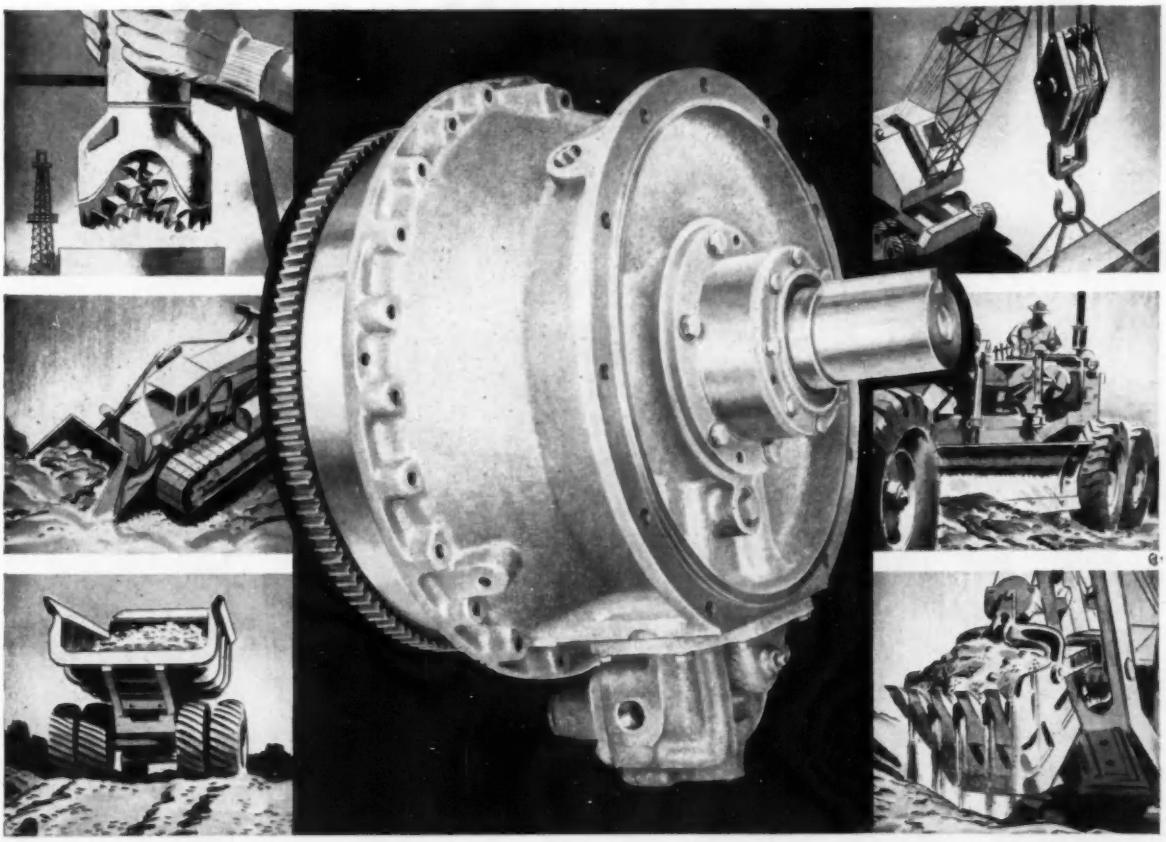
Accuracy is inherent in the basic design of Tru-Lay Push-Pulls. They are precision products, not gadgets.

Capacity ranges from light jobs up to jobs of 1,000 lbs. input. These Push-Pulls will handle jobs 150 feet or more from the control point.

"Solid as a rod, Flexible as a wire rope" aptly describes Tru-Lay Push-Pull Controls. This flexibility provides positive, remote action whether anchorages are fixed or movable . . . it damps out noise and vibration . . . it greatly simplifies installation of controls by reducing the number of working parts and by making it possible to snake around obstructions.

Adaptability to all sorts of mechanical situations explains, in large measure, the wide-spread application of Tru-Lay Push-Pulls. Standard anchorages, fittings and heads have been designed that meet requirements on approximately 80% of the installations. Simple modifications of these standards, or minor changes in your own design, cover almost every special situation. Our engineers have the know-how on such matters, and will work with you.

For Further Information—The DATA FILE pictured at the left contains six booklets and bulletins that will answer any further questions you may have about this versatile and dependable tool. It is quite likely that this material will point the way to a simplified solution of your remote control design problems. Write for a copy.



Versatile is the word for the Torqmatic 500

NAME the gasoline- or Diesel-powered equipment you buy or build in the 150 to 350 horsepower range and it's a sure bet that it's available—or will be soon—with the Series 500 TORQMATIC, *the world's most versatile torque converter.*

Scores of manufacturers—making such varied equipment as cranes, shovels, drilling rigs, log loaders, ditchers, industrial locomotives, scrapers, graders and off-highway trucks—specify the TORQMATIC 500 in the equipment they build, and with good reason.

In one standard housing it gives them a choice of 4 ranges, 7 torque ratios—*and* permits operators to standardize on *one* type of converter for *all* their equipment within the horsepower range.

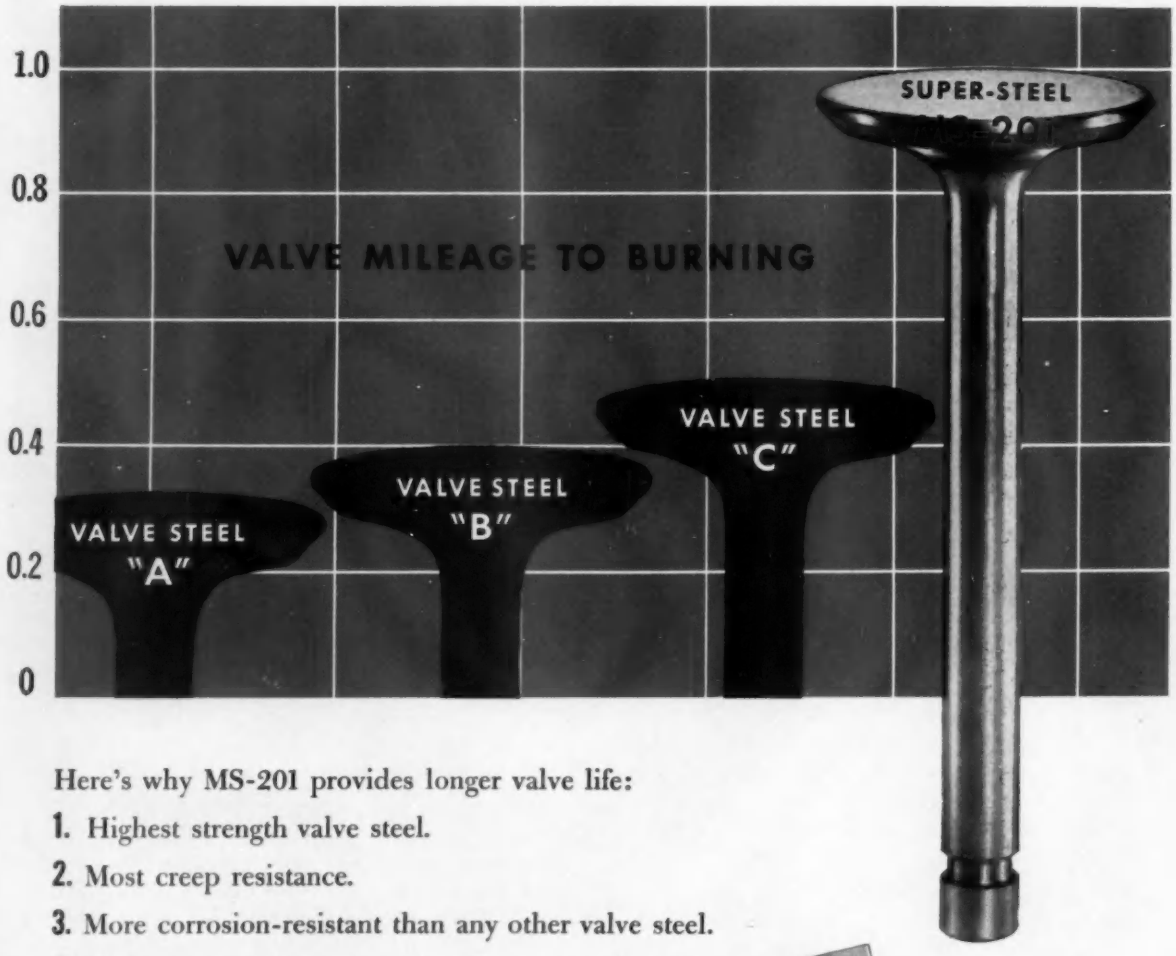
In many applications it permits the use of lower horsepower engines with no reduction in *working* power because the TORQMATIC 500 multiplies engine torque anywhere from 250% to 360%—*and* means equipment owners will cut operating costs and get more work done per shift.

For full details on the Series 500 TORQMATIC Converter in your equipment write to:

Allison Division of General Motors
Box 894A, Indianapolis 6, Indiana

GM TORQMATIC *Allison* TORQMATIC DRIVES

Thompson's New MS-201 Alloy
Doubles Valve Life



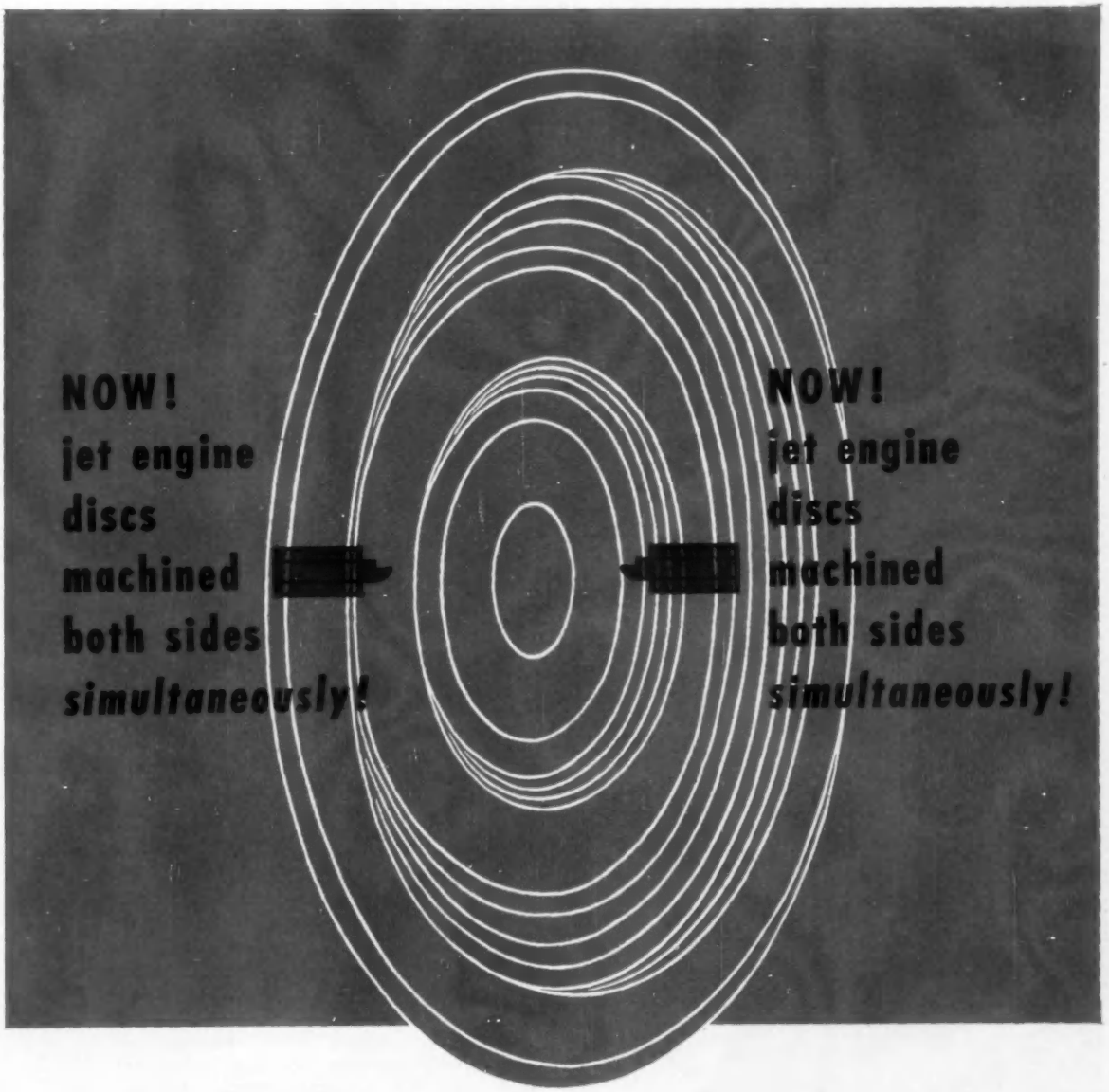
Here's why MS-201 provides longer valve life:

1. Highest strength valve steel.
2. Most creep resistance.
3. More corrosion-resistant than any other valve steel.
4. Higher hot-hardness than any other austenitic alloy.
5. Highest room temperature hardness than any other austenitic alloy.
6. Lowest critical alloy content of any austenitic alloy.

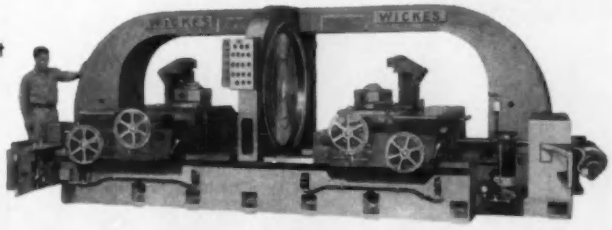
The detailed story of this interesting valve development is featured in Thompson Products' Engineering Bulletin Vol. 1, No. 1.

Valve Division Thompson Products, Inc.

1455 EAST 185th ST. • CLEVELAND 10, OHIO



WICKES, pioneers of the center drive principle, announce a center drive profiling lathe specifically designed to machine both sides of jet engine discs at the same time • Due to equalized pressure of tools on each side of disc, flatness, parallelism and concentricity are obtained that were never before possible • Single chucking eliminates stack up of tolerances • Controlled by 360° tracer • Constant cutting feet per minute and constant feed per revolution produce a highly superior finish • Stainless steel or titanium are readily machined in this set-up.



FOR MORE DETAILED INFORMATION ON THIS MACHINE WRITE US TODAY.

WICKES MACHINE TOOL DIVISION • THE WICKES CORPORATION • SAGINAW, MICHIGAN

OVER 100 YEARS' EXPERIENCE IN SOLVING PRODUCTION PROBLEMS

ELECTROPLATERS:

"Blast" off heaviest smuts

with PENNSALT ELECTROCLEANER K-8

Pave the way to a smooth, bright plate with minimum rejects—use Pennsalt Cleaner K-8*, the KING OF ELECTROCLEANERS.

The high conductivity of K-8 lets high currents flow at moderate voltages, produces a strong electrolytic "scrubbing" action that removes the most stubborn heat-treating smuts, impacted mill oils, and drawing compounds. A new combination of surfactants and balanced alkalies in K-8 gives you cleaner steel or copper for a consistently better plate. And, once removed, soils are prevented from redepositing; suspended by the K-8 solution, they're easily rinsed off even in hard water.

Remember—where other cleaners fail, Pennsalt Electrocleaner K-8 cleans deep and sure. TRY K-8 IN YOUR CYCLE. Ask the Pennsalt man for a demonstration, or write Metal Processing Dept. 364, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia St., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

*PENNSALT K-8 IS A TRADEMARK OF PENNSYLVANIA SALT MFG. CO.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A BETTER START FOR YOUR FINISH

air-conditioned cover keeps new clutch c-o-o-l

Frictional heat has little effect on the new *Lipe* Direct Pressure Clutch. Air circulating through the cover's 33 ventilating holes dissipates heat rapidly. The result is a heavy-duty clutch singularly free of burned facings and warped pressure plates. A clutch whose low maintenance cost matches its low first cost.

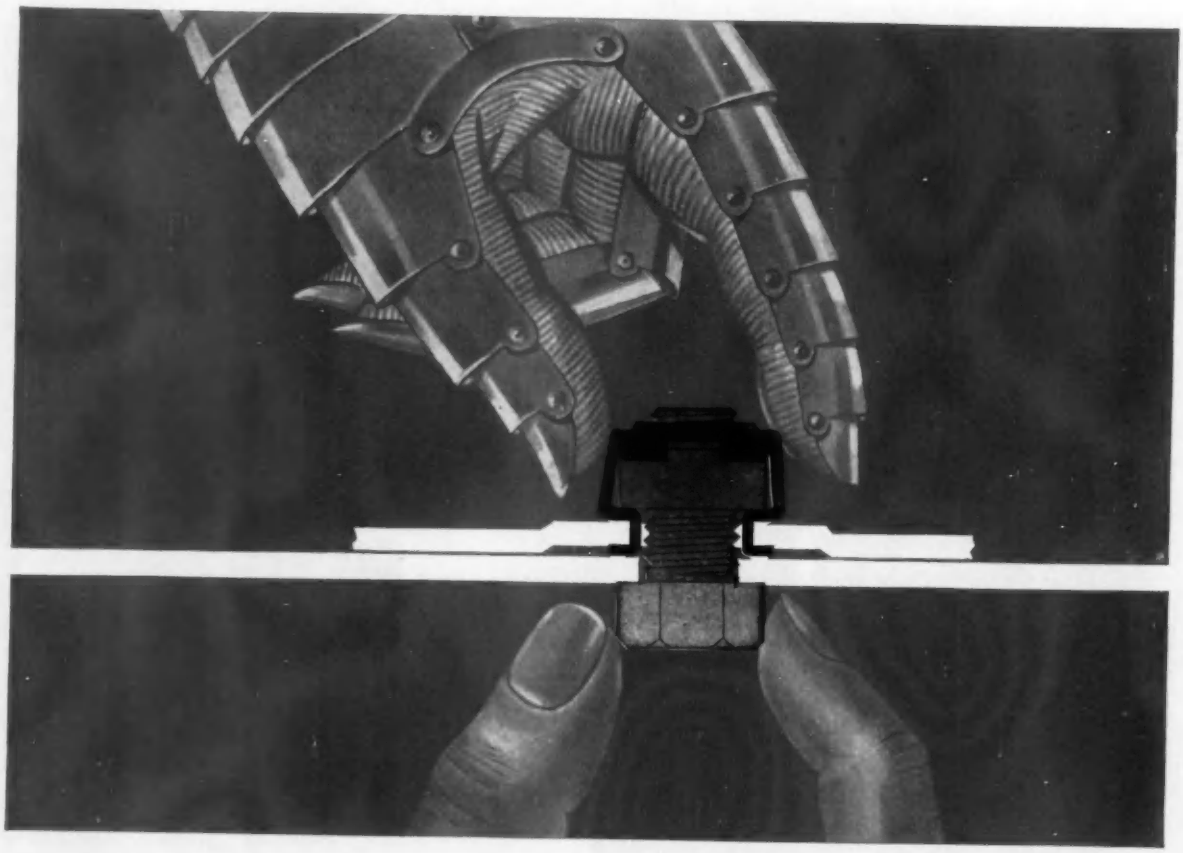
Lipe Direct Pressure Clutches now available: 13", 14", 15" single-plate, 14" and 15" two-plate. Send for complete information.

For the name of your nearest Authorized Lipe Distributor, look under "Clutches" in your telephone directory. Or, write us.

Manufacturers of Automotive Clutches & Machine Tools

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.



FINGERS OF STEEL
that hold where you can't reach

If you can't reach the back of a panel to hold a nut, let the spring steel fingers of a Tinnerman SPEED GRIP® Nut Retainer hold it for you. No welding or staking, no special skills or equipment required. It's the most efficient way to attach a square nut to a panel in blind location.

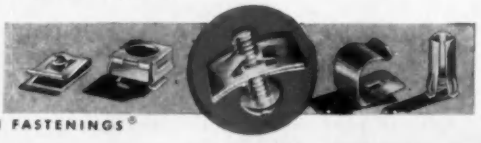
The SPEED GRIP combines a square nut retained in a spring steel cage. The SPEED GRIP snaps easily into the panel. Expensive rigid position methods are eliminated. Nut floats free in the cage to offset minor hole misalignments, but cannot turn as bolt is tightened.

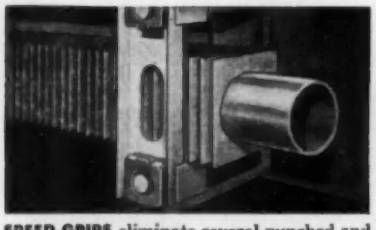
SPEED GRIPS can be put on anywhere along your assembly line . . . no side trips to special stations, no line deviations of any kind. Rustproofed, they can be applied after painting, ending costly masking or retapping of paint-clogged threads.

Consult your Tinnerman representative soon and write for Bulletin No. 335. **Tinnerman Products, Inc., Box 6688, Department 12, Cleveland 1, Ohio.**

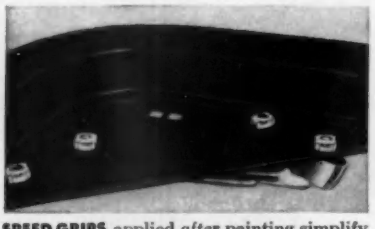
TINNERMAN *Speed Nuts*

FASTEST THING IN FASTENINGS®





SPEED GRIPS eliminate several punched and tapped holes, cut assembly costs 78%, simplify installation of heater.



SPEED GRIPS applied *after* painting simplify blind-location assembly of auto seat handle, avoid paint-clogging of threads.

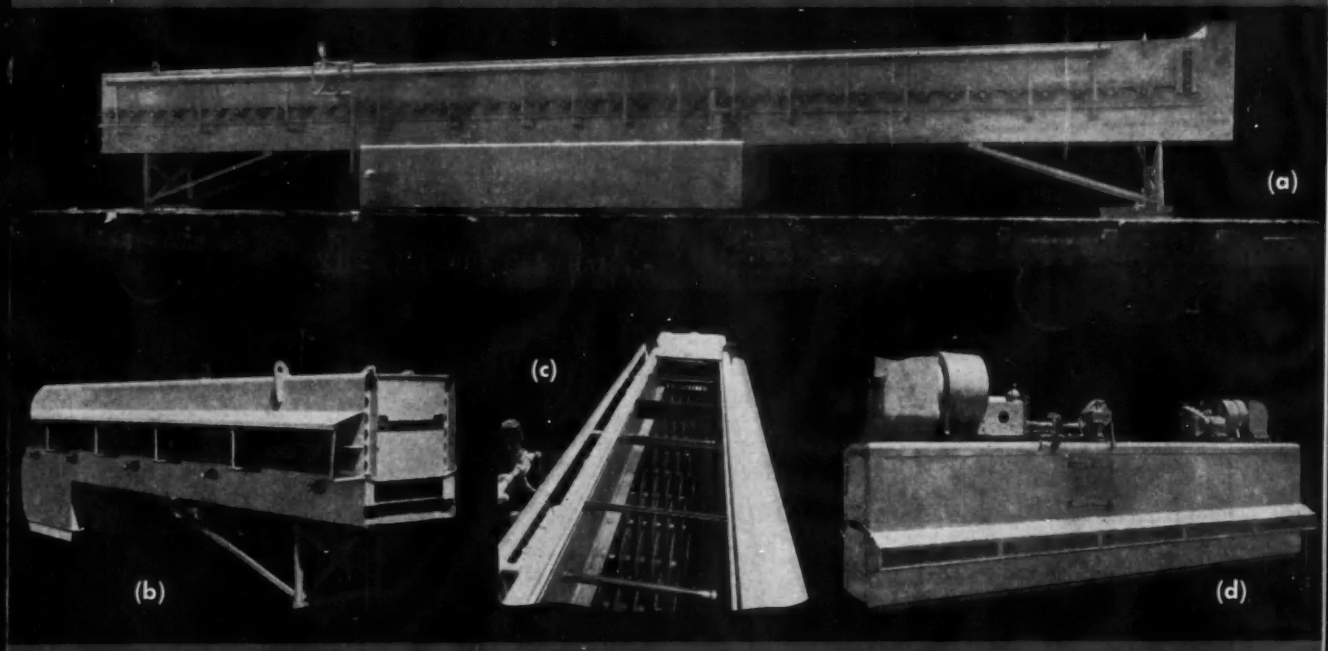
SPEED GRIPS cut costs 75% by replacing tapped holes and weld-type nuts as mounting fasteners on car radio.

CLEAN TREATED, READY FOR FORMING AND FINISHING BLANK

6-STAGE POWER SPRAY PHOSPHATIZING MACHINE

BY PETERS-DALTON

FOR THE TREATING OF STEEL BLANKS, CONVEYED DIRECTLY FROM FLAT POLISHING OPERATIONS, PRIOR TO FORMING AND PAINTING



To meet the requirements of a major appliance manufacturer, Peters-Dalton designed, engineered and fabricated this huge 6-Stage Power Spray Phosphatizing Machine with a heated dry-off oven . . . some of its units are shown here. It has been so designed that all oil or foreign substances are removed in the first two stages. The metal is etched in the last four stages. The illustrations show: (a), one unit loaded for shipment; (b), shows the drive mechanism (on the side) prior to installation of screen guards —also, the double wall construction providing for ventilation; (c), unit with the vapor type covers removed, shows the easily accessible conveying discs and spray headers and nozzles—the staggering of conveyor discs and spray heads insures full cleaning coverage of parts passing through; (d), Gas Fired Dry-Off Oven.

Complete components consist of: 1st stage, alkali cleaner tank, 1600 gals. cap., with heated rinse of 160° to 180°; pump cap., 375 g.p.m.; 2nd stage, cold tank, rinse #1, capacity 475 gals.; pump cap., 100 g.p.m.; 3rd stage, heated rinse #2 of 140° to 160°, 475 gal. tank cap., pump cap., 100 g.p.m.; 4th stage, phosphatizing, 900 gal. tank cap., 145° to 165°, pump cap., 475 g.p.m.; 5th stage, cold rinse, 475 gal. tank cap., pump cap., 90 g.p.m.; 6th stage, chromic acid, tank cap., 475 gals., heated rinse 140° to 160°, pump cap., 80 g.p.m. After these stages, a drawing compound is applied, blanks are then dried in the P-D Gas-Fired Dry-Off Oven, maintaining 400° temp. and consuming one million B.T.U.'s per hr. Conveyor speeds are 45 ft. to 55 ft. per minute; processing capacity—3500 sq. ft. of sheet metal (approximately 11,000 lbs.) per hr.

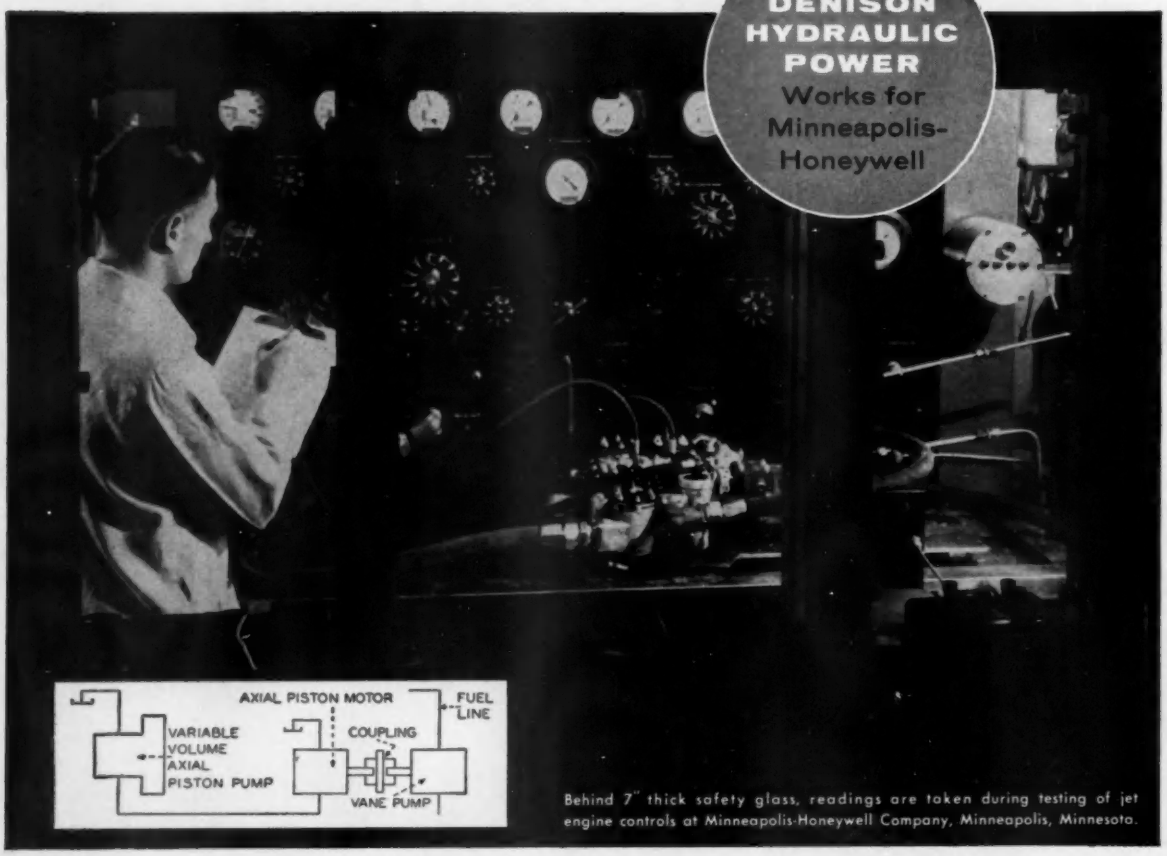
The versatility and ability offered you by the Peters-Dalton organization is demonstrated by this installation. Whether your needs are for a system comparable in size or for a simple single stage washer, you can depend upon P-D to design, engineer, fabricate and install it — with complete confidence and with the assurance that P-D equipment will do the job for which it was built . . . the job you want. We'll be glad to tell you more . . . just write, wire or phone.

Representatives in principal cities.

- *Hydro-Whirl Paint Spray Booths*
- *Industrial Washing Equipment*
- *Drying and Baking Ovens*
- *Hydro-Whirl Dust Collecting Systems*

PD Peters-Dalton INC.
A SUBSIDIARY OF DETROIT HARVESTER CO.
17930 Ryan Road • Detroit 12, Michigan

How **DENISON HYDRAULIC POWER** Works for Minneapolis-Honeywell



Behind 7" thick safety glass, readings are taken during testing of jet engine controls at Minneapolis-Honeywell Company, Minneapolis, Minnesota.

Providing the muscle power for a "ghost" engine

Denison Variable Volume Axial Piston Pump remote controlled.

A unique electronic system developed by Minneapolis-Honeywell to pre-test jet engine controls now eliminates the cost of building and operating a special engine test cell. The system actually produces a more accurate record of performance than would be possible if the actual engine were used.

The system works this way. An analog computer takes the place of the jet engine. Performance data and other characteristics are received from the manufacturer. These are then simulated on the computer and reproduced as electrical signals, which, in turn, run the engine controls.

To provide dependable muscle power for this control system, Minneapolis-Honeywell relies on Denison hydraulic pumps and motors. The key unit, a Denison Variable-Volume Axial Piston Pump is the prime mover for a Denison axial piston motor that in turn powers a Denison vane pump to deliver jet fuel.

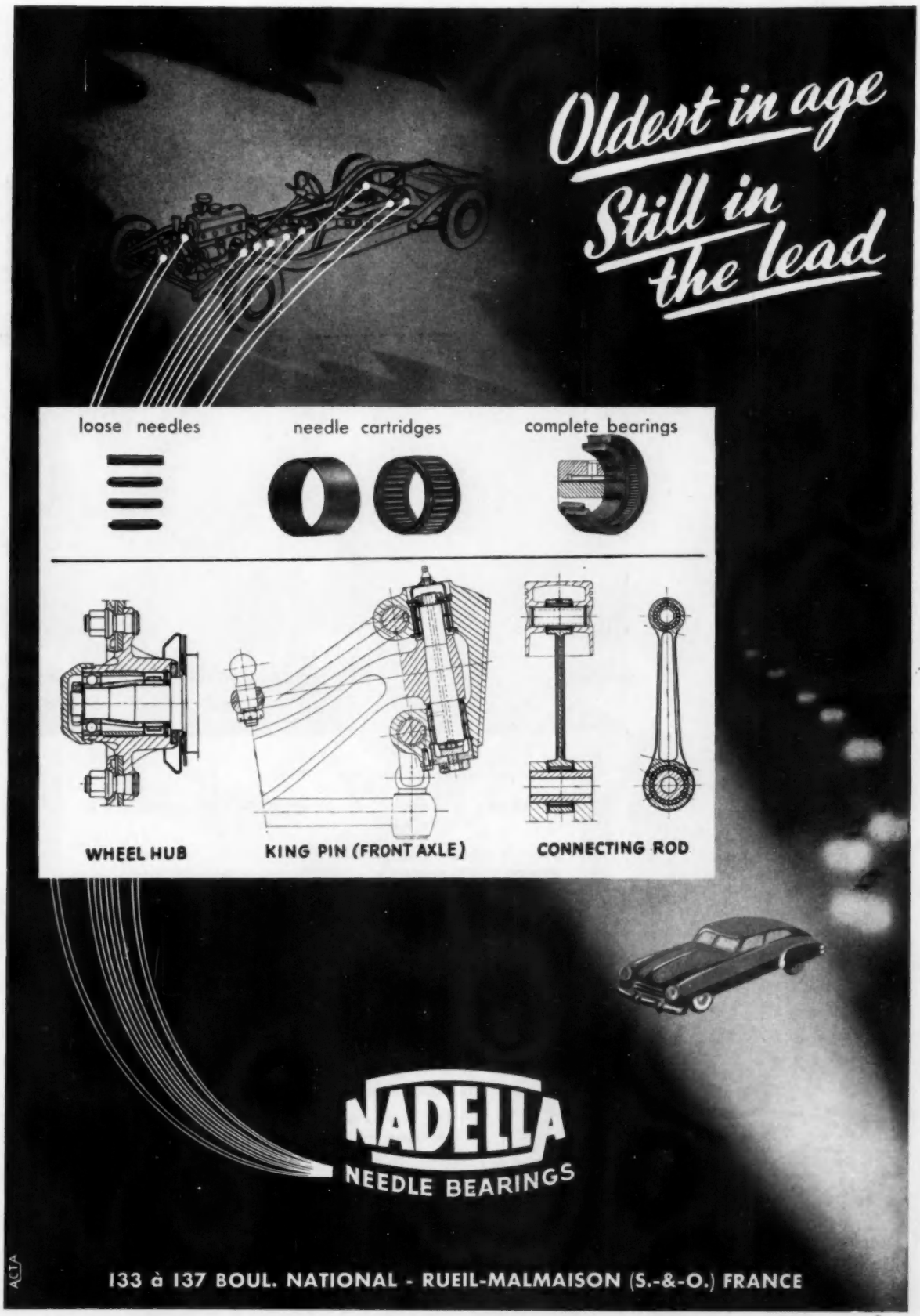
Denison hydraulic equipment is today serving all industries by cutting operating costs, speeding production, and improving reliability. Let a Denison field engineer show you how you can benefit from Denison's hydraulic experience. Write Denison Engineering Division, American Brake Shoe Co., 1212 Dublin Road, Columbus 16, Ohio.

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

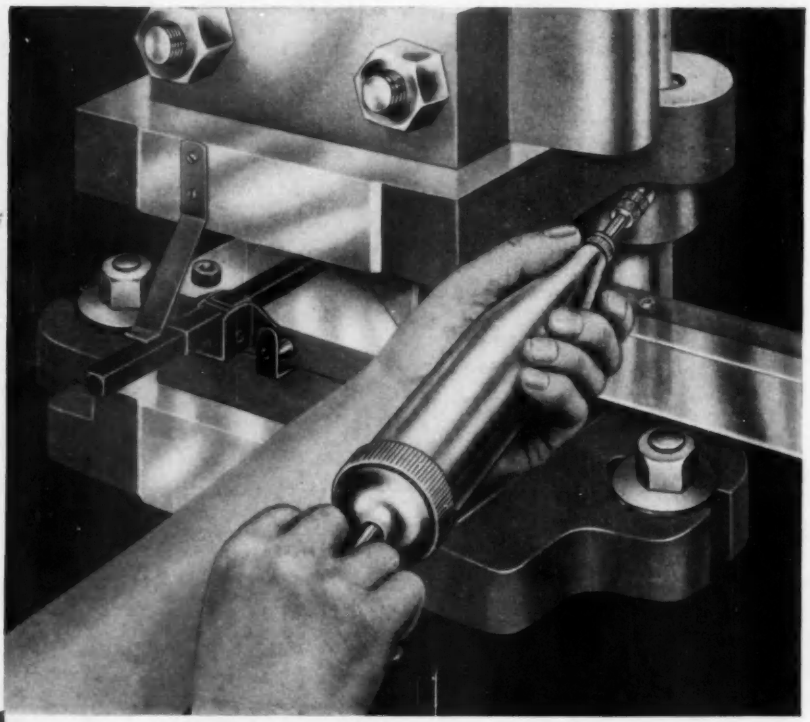
DENISON Hydr OIL ics

Hydro-Whirl Dust Collecting Systems

17930 Ryan Road • Detroit 12, Michigan



NEW oil lubrication system



DANLY

ON NEW DANLY DIE SETS

Here is another example of Danly leadership in die set design . . . the new oil lubrication system for guide posts and bushings. The illustration shows how easily a lubrication gun reaches the oil fitting in the shoulder of the bushing. Once injected, oil fills figure-8 oil grooves in the bushing to assure uniform lubrication for protection that lasts even through long press runs . . . less frequent oiling is needed, the job is done faster. Isn't this new lubrication system another important reason why you should specify Danly die sets?

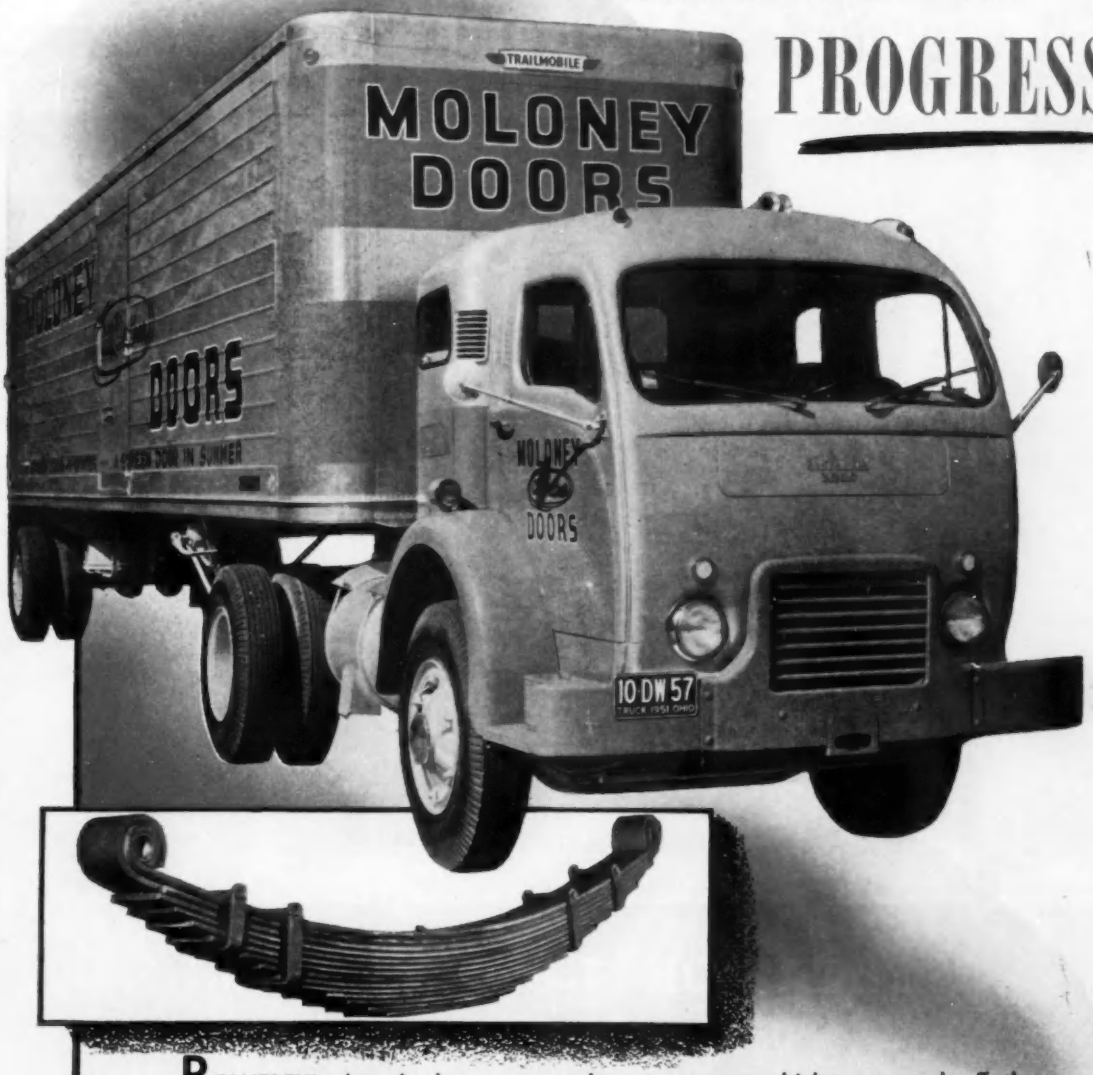
complete new "leadership line" catalog

More than 200 pages provide you with more complete design information, easier selection of die sets and supplies. Write for your copy today!

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Ave., Dept. B, Chicago 50, Illinois

FOUNDATION FOR PROGRESS



POWERFUL though they are, modern transport vehicles, on and off the highway, are subject to limiting factors of the roads they travel. How fast they may go, how well they ride, their stability on the road, the safety of their loads depends on the *springs* . . . the "foundations for progress".

Burton springs, supplied as standard equipment on White all Series trucks are "foundations for progress" of all kinds of bulky and heavy products carried in these dependable vehicles.

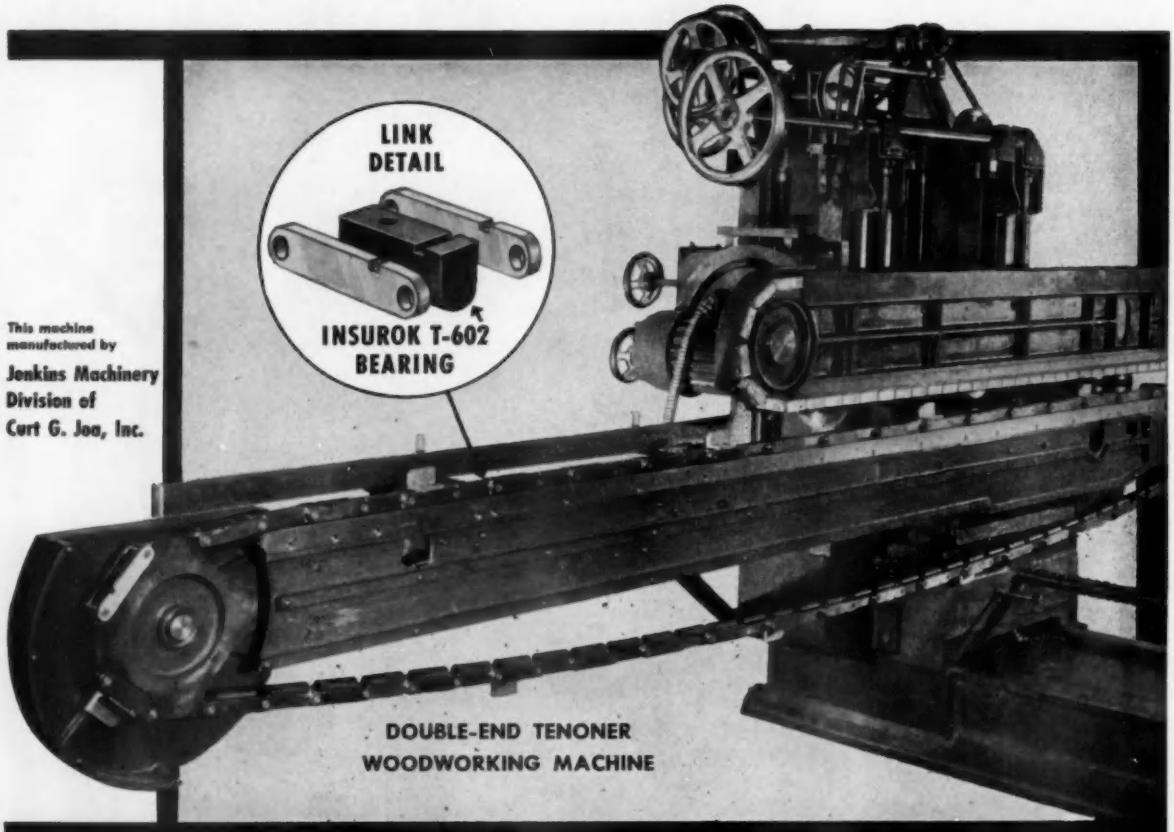
Your spring problem too, may well find a better solution through BURTON experience in spring engineering. We invite consultation.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

OIL STAINING ELIMINATED
with Self-Lubricating Plastic Bearings



INSUROK® T-602 replaces metal . . .
Doubles life of bearing and track

Lubricating the chain and track on this woodworking machine was formerly a difficult problem. If enough oil were provided for proper lubrication, it would drip and stain the wood. On the other hand, if the oil supply were reduced, the ever-present sawdust, woodchips, and glue particles would cause excessive abrasion and wear—shortening chain life and reducing the accuracy of the machine.

When the manufacturer replaced the aluminum bearing surfaces with inserts of INSUROK T-602—a self-lubricating graphitized phenolic laminate—the problem was solved. Since little or no oil is required, oil leakage and wood staining are eliminated. Furthermore, the life of the chain is doubled, and the accuracy of the machine is maintained.

Investigate the possibilities of this labor-saving, self-lubricating material in your product. Write or phone today for a data sheet on T-602.

Write for newly published bulletin, "Richardson Insurok Laminated Plastics."

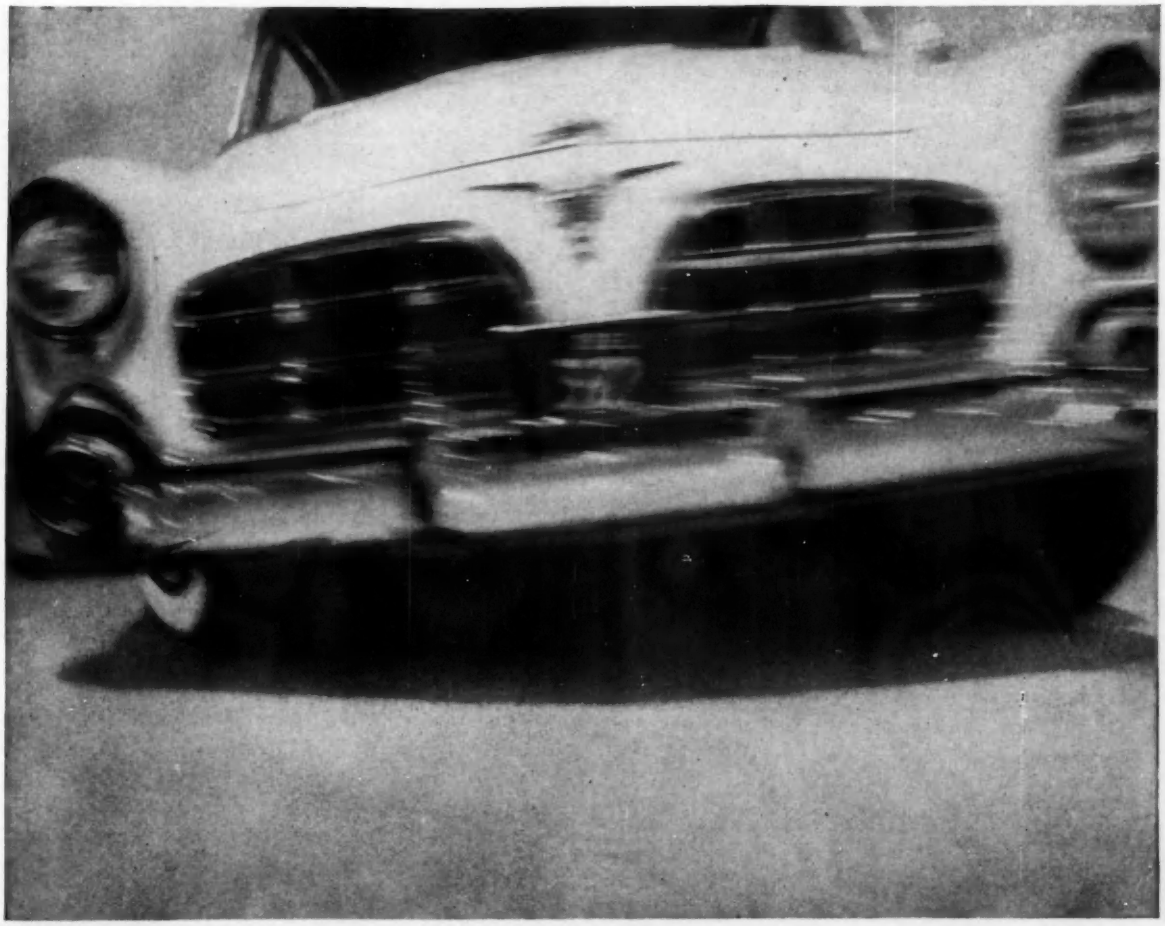
The RICHARDSON COMPANY

FOUNDED 1858

2678 Lake Street, Melrose Park, Illinois (Chicago District)

SALES OFFICES IN PRINCIPAL CITIES

SIX PLANTS



Typical tire distortion caused by high-speed turn. Tougher, stronger nylon cord tires resist damage from such everyday punishment.

THERE'S EXTRA SAFETY IN NYLON CORD TIRES

Du Pont produces the nylon fiber.
Tire manufacturers make nylon cord tires
—in tubeless or conventional types.

Tires are among the components that can help make today's fine cars even safer. For our roads—whether superhighway or city street—are traveled to a point that tire failure of *any* kind is a potential danger.

- Nylon cord tires offer utmost safety, surest protection against tire trouble. Nylon tires have proved their superiority on military and commercial planes and on heavy-duty trucks. The people whose lives and livelihood depend on the ability of cars to perform at high speeds rely on nylon tires. Turnpike police, professional auto racers and high-speed test drivers are examples.
- Nylon cord tires reduce unsprung weight, and they readily absorb the added strains of power steering, braking, and higher horsepower.
- Nylon cord tires are among the components which contribute importantly to motor-car safety. They are the coming standard of the industry. As original equipment, they provide a valuable sales feature—extra safety.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DU PONT

REG. U. S. PAT. OFF.

Honing for Perfection of Ross Hydropower Linkage

Ross Gear & Tool Company of Lafayette, Indiana, has long been noted for its Hydropower linkage-type power steering control. Used in the toughest kind of service, on vehicles produced by International Harvester, J. I. Case, John Deere, Towmotor, Mack, Diamond T—and other equally notable manufacturers—Ross equipment has well earned its reputation in its field.

At the heart of this rugged hydropower unit is a length of B&W Electric-Resistance-Welded Mechanical Tubing. Machined to close tolerances, honed to micro-inch smoothness, then threaded, it forms the basic component to which other vital parts are fitted, internally and externally. It is the strategic member of the assembly.

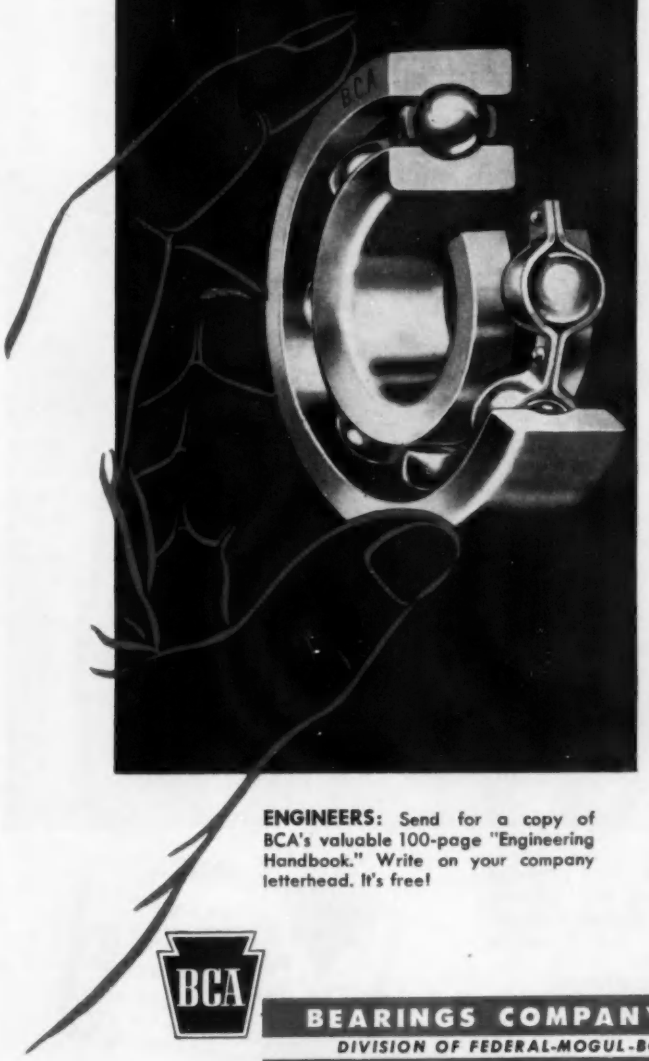
When you have need for tubing of uniformly high character . . . tubing on which you can depend every day, send for Mr. Tubes, your nearby B&W Tube Representative. *Or write for Bulletin 362.* The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

TA-5049(M)

Seamless and welded tubular products, seamless welding fittings and flanges—in carbon, alloy and stainless steels

BCA

SINGLE ROW, DEEP GROOVE RADIAL BEARINGS



. . for superior performance in even the toughest applications

The ability of these BCA Conrad type ball bearings to sustain combined radial and thrust loads or thrust loads alone—in either direction—even at extreme high speeds, stems from design features like these . . .

- Largest size balls are used to give optimum ratio of ball diameter to bearing race section at the points of heaviest stress.
- Deep, uninterrupted ball raceways . . . precision-ground to conform closely to ball curvature.
- High shoulders on inner and outer raceways support balls laterally and permit bearing to carry thrust loads equal to 100% or more of the radial load rating.

You can count on BCA bearings for the kind of performance you are looking for . . . and on BCA for the flexibility you need to fill both your routine and emergency bearing needs.

ENGINEERS: Send for a copy of BCA's valuable 100-page "Engineering Handbook." Write on your company letterhead. It's free!

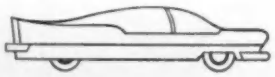
BCA

BEARINGS COMPANY OF AMERICA

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.

LANCASTER • PENNSYLVANIA

Imagineering the 195X models . . . in Alcoa Aluminum



Engineers play Sherlock Holmes to measure piston temperatures

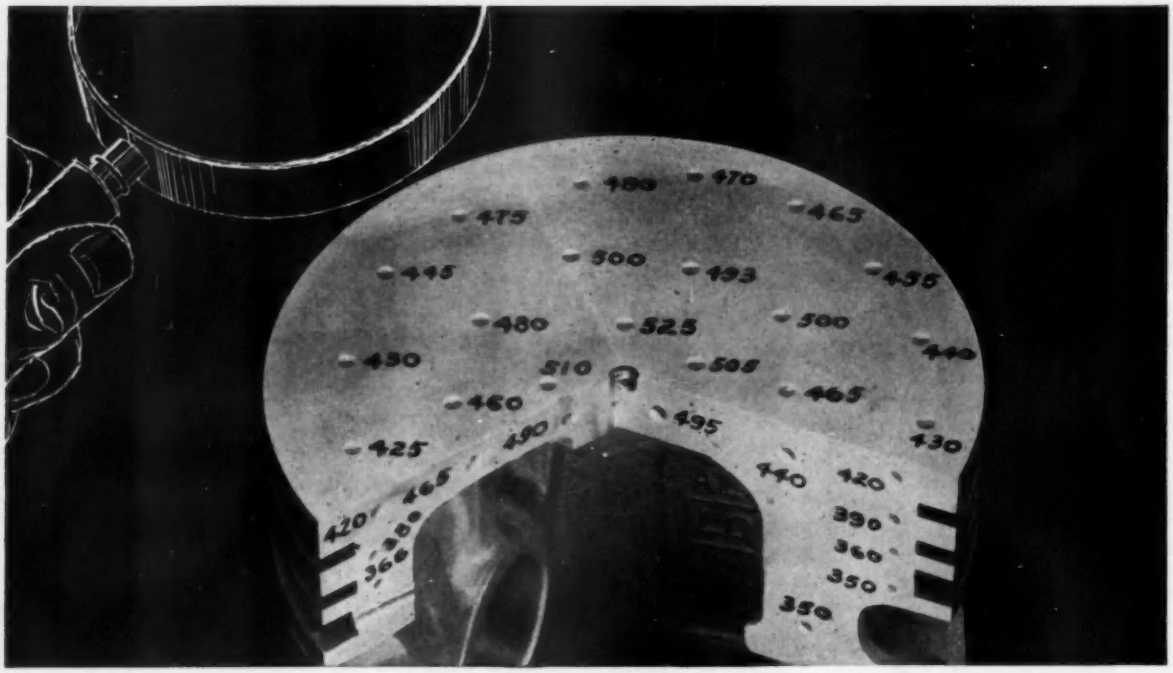
Everyone knows there's a raging inferno inside the cylinders of an internal combustion engine but specific temperatures are hard to determine. Engineers could only guess the answer to the question: "How hot do pistons get?"

Instrumentation for temperature determination in a piston traveling up and down hundreds of times per minute is difficult and short lived. This was the problem faced by the engineers at Alcoa's Cleveland Development Laboratories. Yet the mystery was solved in a manner that would do credit to the famous Sherlock Holmes. The "clue" that broke the case was the fact that aluminum of a special alloy and temper loses hardness due to accelerated aging when exposed to high temperatures. The drop in hardness is very closely related to the temperature and the exposure time.

Pistons cast from this special aluminum alloy were run in an engine at specified test conditions for a recorded number of hours. Then they were removed and shipped to the Alcoa Development Laboratory in Cleveland for Brinell hardness tests.

Actual hardness was compared with the known curves to determine accurately the operating temperature of critical locations in the piston. Variations from cylinder to cylinder in cooling characteristics and inlet manifold distribution become evident from a complete piston temperature survey.

In this case, the superb facilities and imaginative people of Alcoa's Development Division produced data which result in still better aluminum pistons. We would like to use these facilities and these people to help you imagineer better parts for *your* 195X (or 6X) models . . . from Alcoa® Aluminum.



Problem: Determine piston operating temperatures. Method: Alcoa engineers measured the "drop in hardness" which was then correlated with operating temperatures. Result: Better pistons. Suggestion: Let our superbly equipped Development Division help *you* imagineer your new aluminum parts. Aluminum Company of America, 1841-J Alcoa Building, Pittsburgh 19, Pa.

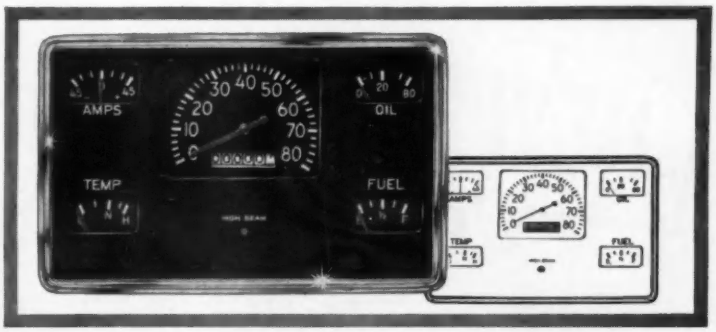
THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Always Fasten Aluminum With Alcoa Aluminum Fasteners

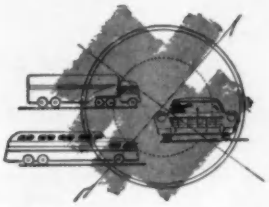
WE CHOSE
ALCOA ALUMINUM
MILL PRODUCTS
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

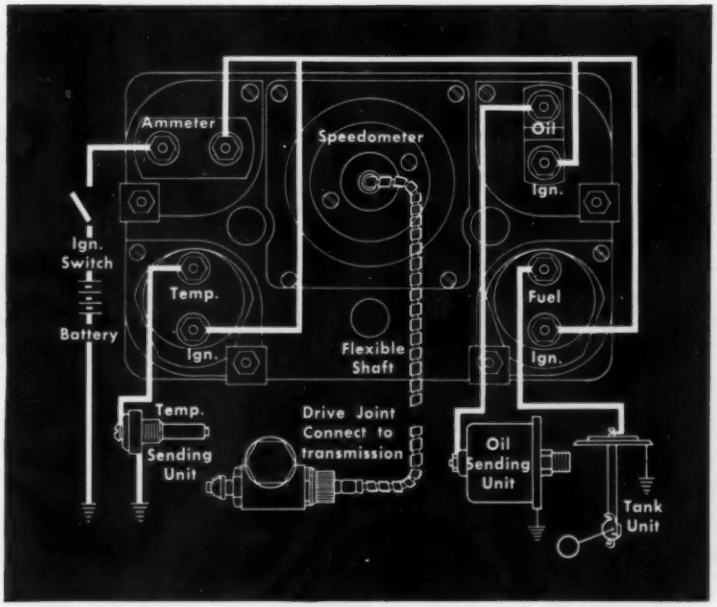
How STEWART-WARNER can help you plan a complete INSTRUMENT PANEL



Stewart-Warner Panel 602-H. A stock panel now used by leading truck manufacturers. Highly flexible—can be fully electric or combination of electric and mechanical.



...from designs to finished panels ...custom-made or stock models —for cars, trucks, buses and engines!



Typical Hook-up for Panel 602-H. Above panel includes mechanical speedometer, electric gauges, complete with sending units.

At every step of design—from styling of panel to choosing drive equipment—Stewart-Warner offers you the widest selection . . . plus engineering teamwork unmatched by any other manufacturer!

Stewart-Warner furnishes the most complete line of individual instruments—speedometers, tachometers, tachourmeters—and gauges of all types. Our engineers will help you combine these in one of our many standard panels . . . or an entire panel can be custom-made to your specifications.

Stewart-Warner—instrument specialists for over half a century—can supply all your instrument needs and drive equipment *from one dependable manufacturing source.* Save money by consulting Stewart-Warner now. . .while your designs are still in the early planning stage and are subject to modification!

For further information, write:

STEWART-WARNER

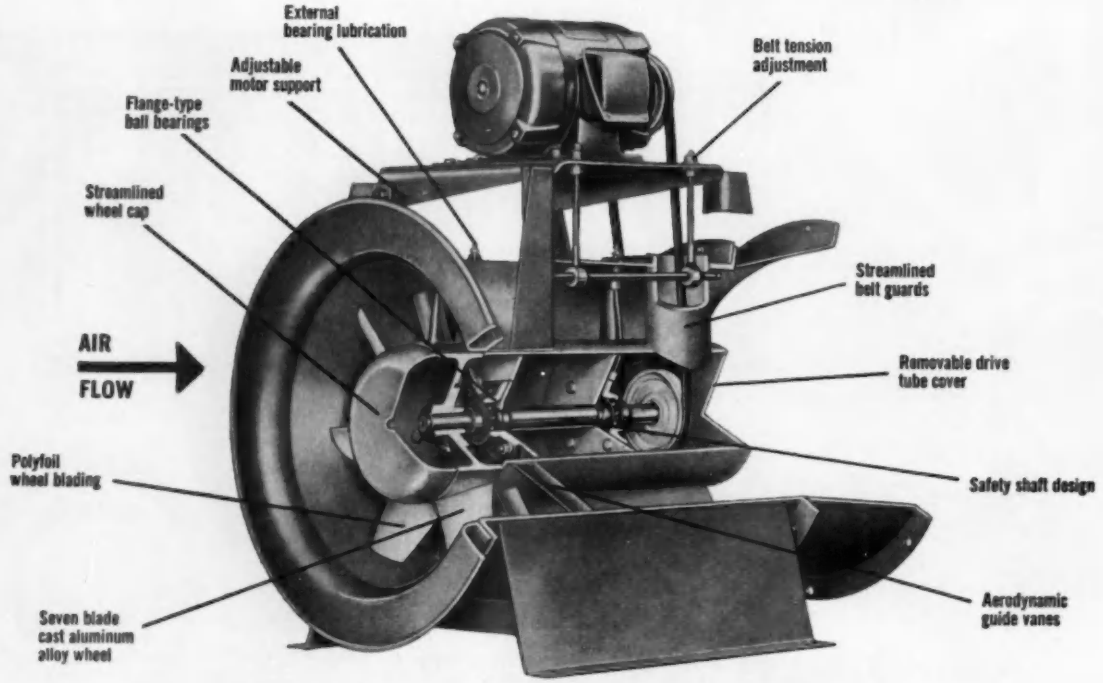
Dept. T-96, Original Equipment Sales

1826 Diversey Parkway • Chicago 14, Illinois

STEWART SW WARNER

NEW Improved Westinghouse Axial Flow Fans

for Industrial air, fume, vapor handling jobs!



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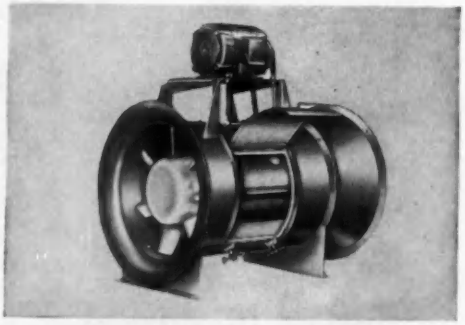

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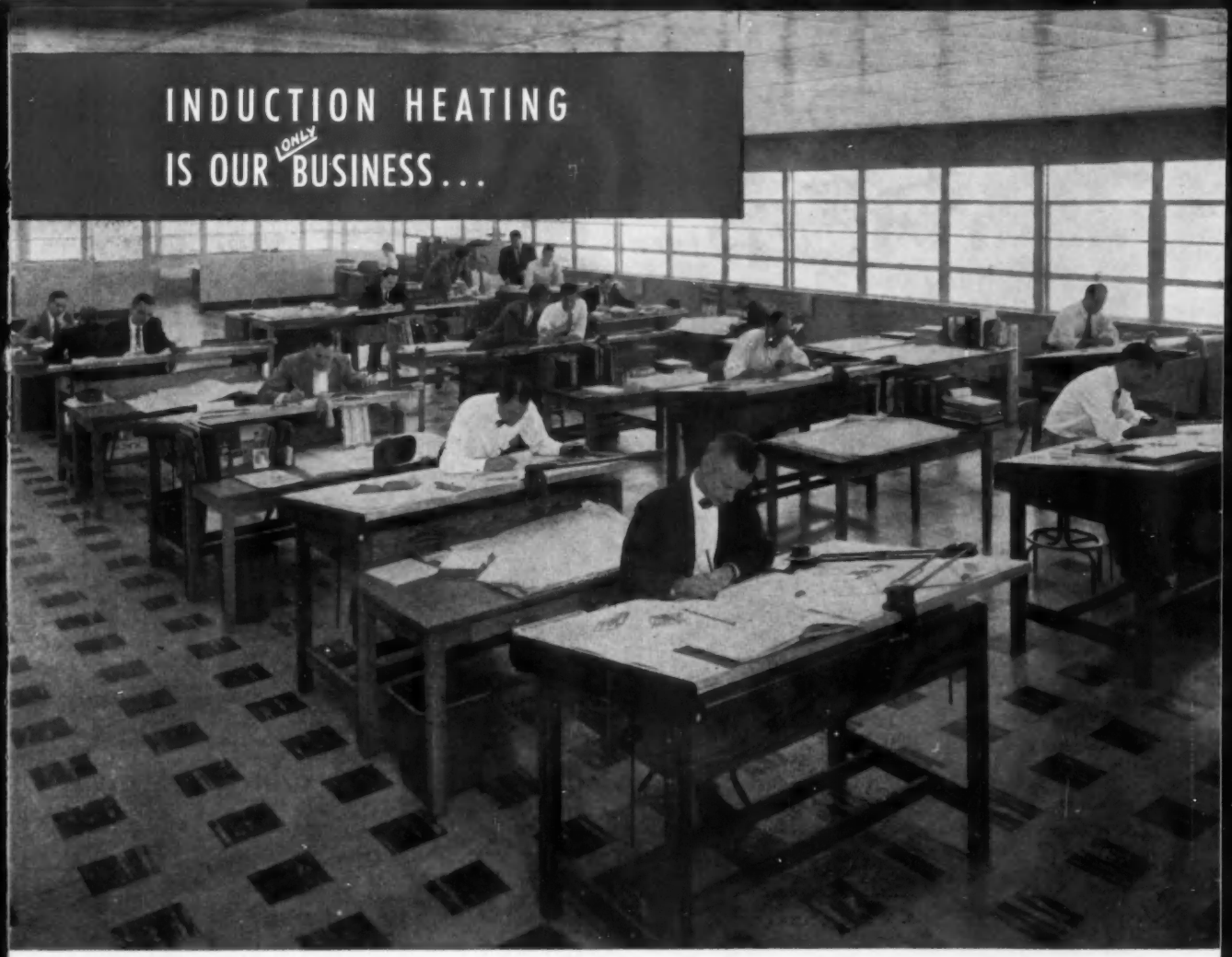

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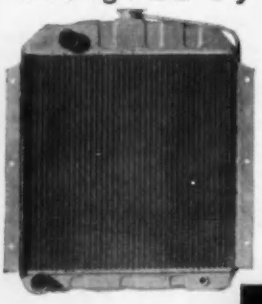

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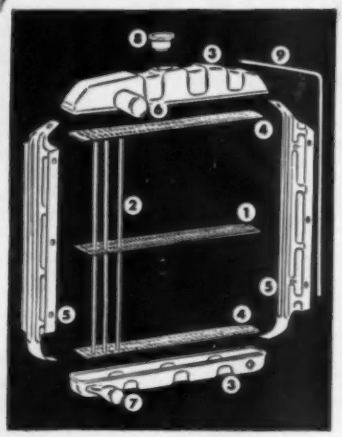

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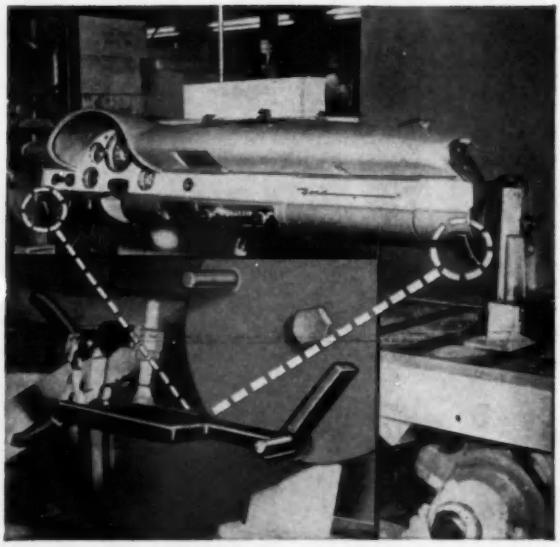

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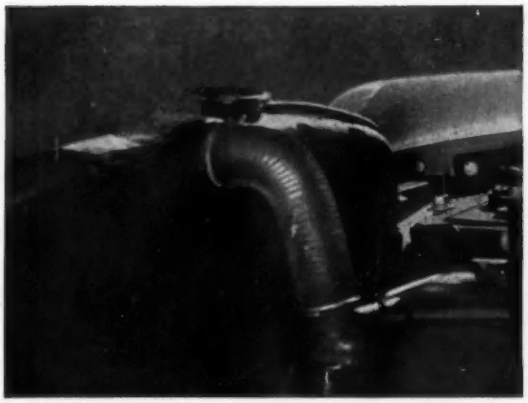

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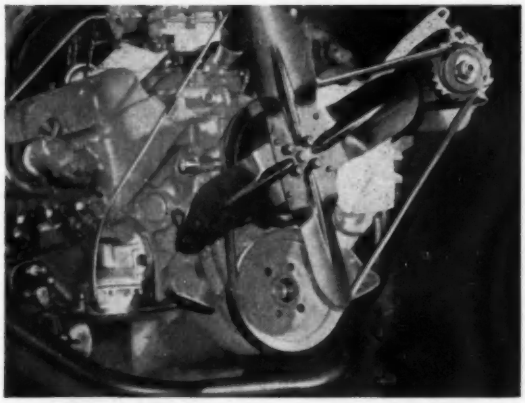

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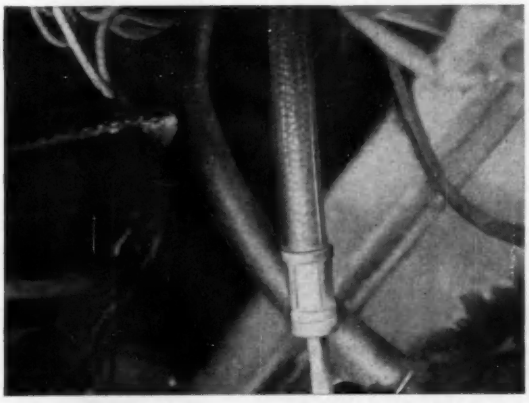

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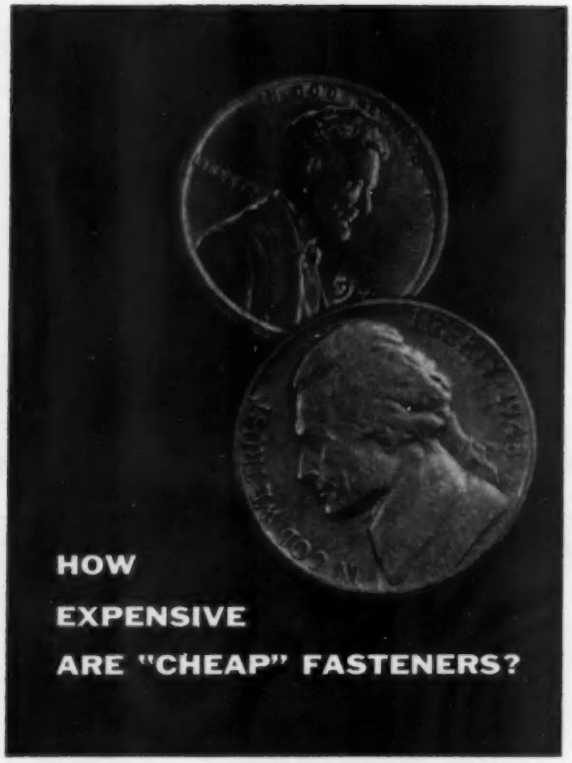

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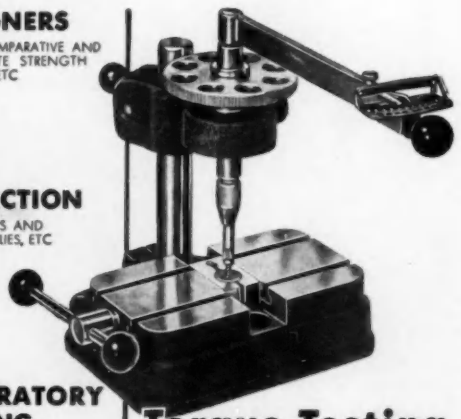

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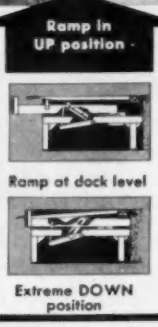

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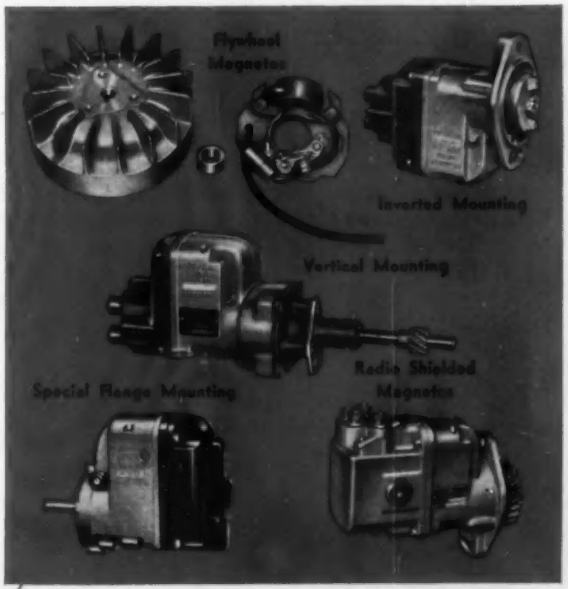

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covering the issues from January 1 to June 15 and from July 1 to December 15, 1955, inclusive and from January 1 to June 15, 1956, inclusive

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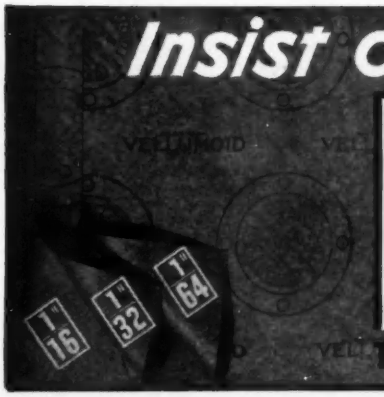

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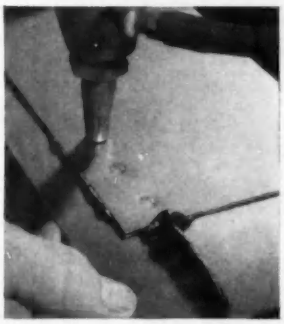

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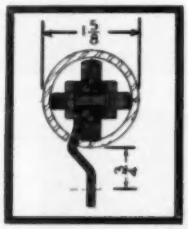

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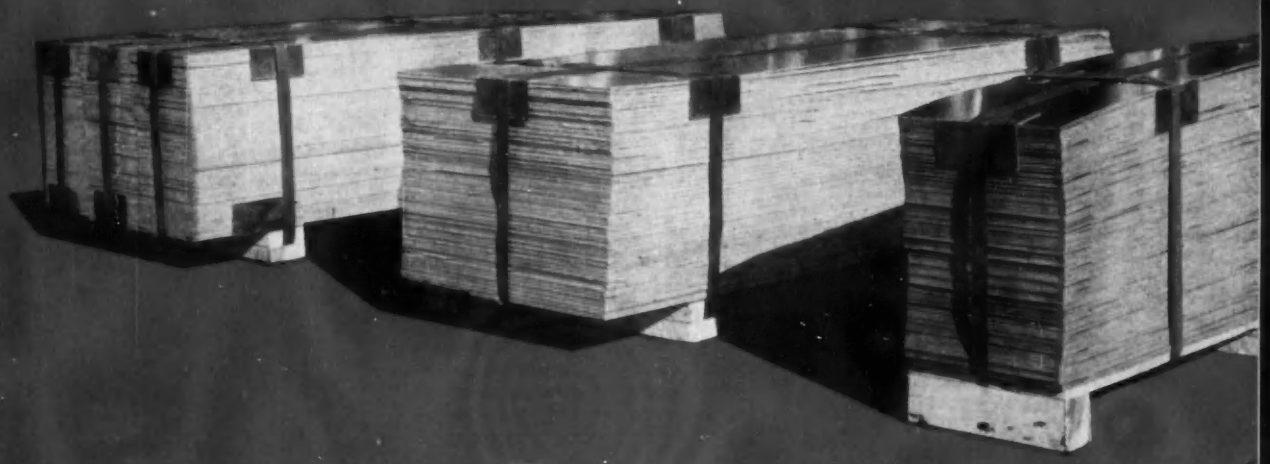

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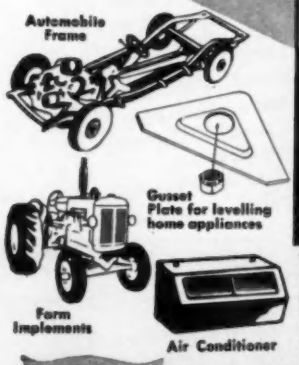

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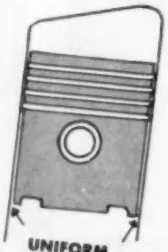

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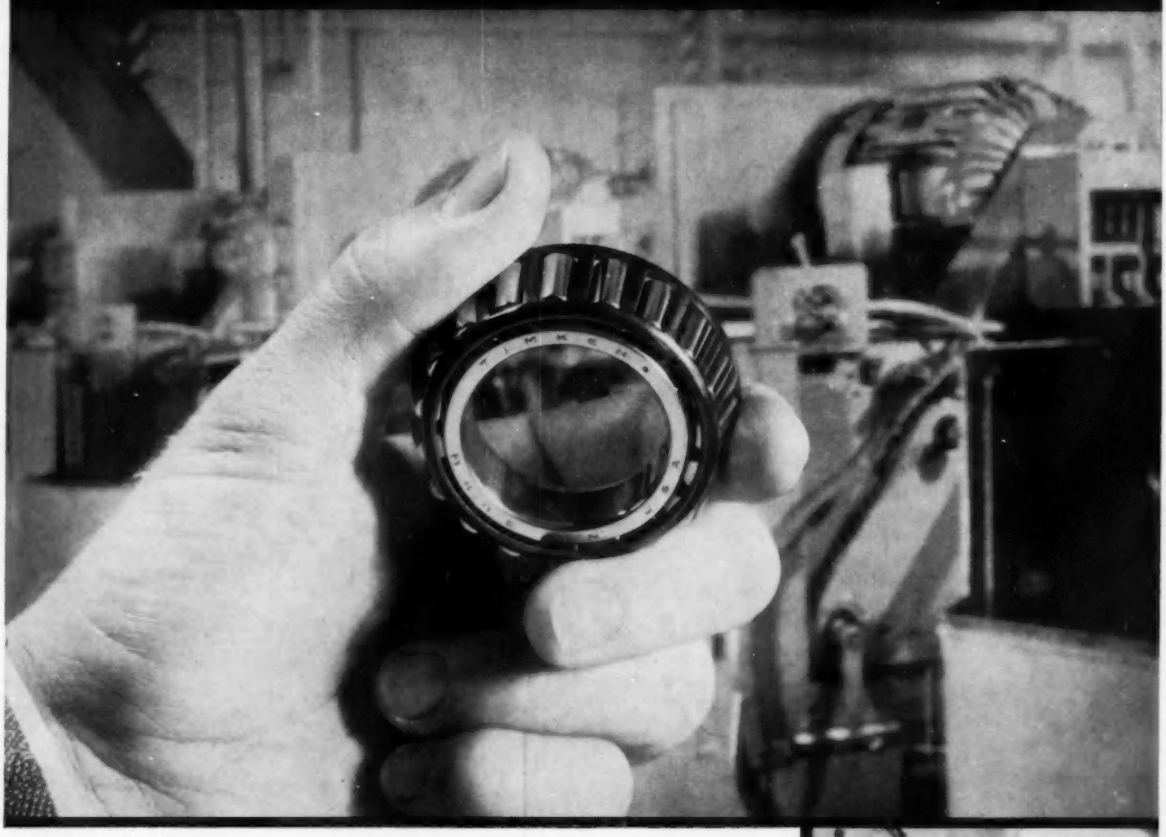

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